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NEW ZEALAND PLANTS AND GARDENS

The Official Journal of the Royal New Zealand Institute of Horticulture (Inc.)

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PLANTSMAN'S POET

1964 marks the 400th anniversary of the birth of William Shakespeare, poet and dramatist. It is being honoured throughout the whole of the English speaking world. But his work does not simply classify itself under histories, tragedies and comedies. Shakespeare was a great lover of nature, particularly those unsophisticated plants of his native Warwickshire. His boyhood and early youth was spent in one of the loveliest counties of England

'When daisies pied and violets blue
And lady-smocks all silver-white
And cuckoo-buds of yellow hue
Do paint the meadows with delight'.

There are countless references, in his works, to flowers and country life, for this Warwickshire lad was, above all else a countryman, of sturdy yeoman stock. His work took him to the city, but his heart was in the countryside.

During his many journeys between Stratford-upon-Avon and London, along rough highways, bridle paths and tracks through the greenwood he gained inspiration from many of the flowers he saw growing there. Where else could he have found these lines he gives to Oberon?

'I know a bank where the wild thyme blows,
Where ox-lips and the nodding violet grows,
Quite over canopied with luscious woodbine,
With sweet musk roses and with eglantine'.

The wild daffodil was plentiful in open woodland in Shakespeare's day, and so was the wild violet, given prominence by the contemporary herbalist Gerard and, later, by Parkinson. Both flowers inspired the pastoral beauty of Perdita's lines

'..... daffodils
That come before the swallow dares, and take
The winds of March with beauty; violets dim,
But sweeter than the lids of Juno's eyes
Or Cytherea's breath:'

And Shakespeare must have known the difficulty in pollination the wild primrose has, for Perdita continues.

'..... pale primroses
That die unmarried, ere they can behold
Bright Phoebus in his strength — a malady
Most incident to maids; bold ox-lips and
The crown imperial; lilies of all kinds,
The fleur-de-luce being one!'

When Shakespeare retired to his great new house, called New Place, at Stratford-upon-Avon, there to spend the evening of his life, he planted a mulberry tree. He also made a garden where he undoubtedly spent much time tending his plants. It was in these latter years that he speaks through Polixenes in 'The Winter's Tale'

'..... We marry
A gentler scion to the wildest stock,
And make conceive a bark of baser kind
By bud of nobler race: this is an art
Which does mend nature, change it rather, but
The art itself is nature.'

Can there be any doubt that Shakespeare was a gardener?

G. A. R. PHILLIPS, Editor.

TULIP SPECIES

I. D. RANKIN (Ashburton).

Some twelve years ago while I was resident in Timaru, a good friend who grew tulips commercially handed me some bulbs with the words, 'These are Princeps. See how you like them.' What a pity he is not alive to-day to see how much enjoyment I derive from growing a collection of tulip species which had its beginning from such a simple friendly gesture. Yes, from the following Spring when those few lovely red blooms appeared, I was lost and embarked on what has become an absorbing, if somewhat slow process, gathering what I think is a really representative selection of the genus *Tulipa!*

Of course no measure of success comes easily, and I must confess that the early years were fraught with some problems. I had grown tulips, and at first tried the same method with the species, unfortunately overlooking the vastly different conditions under which these latter grow naturally. The high country of Persia, Asia Minor, Turkey, Afganistan, and Russia provide in the main their natural habitat, where conditions are such that the bulbs are subjected to a cold winter, followed by the spring thaw bringing with it a tremendous flush of growth followed by early ripening of the bulbs, with a long rest in ground that is well drained, becoming very dry in the summer months. Pick up any book which deals with *Tulipa* species, and you will invariably read the words 'leave undisturbed!' Very good advice if your

garden can provide something like the conditions described above, with the accent on drainage. If not I'm firmly convinced that the only safe way is to lift your bulbs annually as soon as the foliage dies down, and store them in a dry cupboard, taking adequate precautions against mice!! By doing this you are creating for the bulbs that essential rest period. For a while I tried leaving them undisturbed, and while bulbs grew in size, the proportion of flowers was low, and some losses were experienced. How well I remember one year when I overplanted the bed with salvias, and looked very crestfallen at the empty spaces the following Spring.

Lifting the bulbs as soon as possible where they have to grow in rather heavy soil tends to produce smaller bulbs, but the proportion of flowering bulbs is much higher, which again illustrates the difference between them and what I term the cultivated tulip, be it Darwin, Mendel, or any of the many types that are now grown. With these, size of bulb is the sure indication of whether or not they will produce a bloom but with the species, it is the ripeness that counts.

So, if you wish to enjoy the experience of growing this charming race of bulbs, and think the soil in your garden is perhaps a little too stiff or badly drained, don't hesitate to incorporate plenty of sand, or even crusher dust if that is available, ensuring that you do not only scratch the surface. It is of no use having only the top few inches of the soil in perfect condition, and forgetting the conditions which may exist getting down to clay level, when some of the species have a tendency to sink. Some varieties, to mention *T. kaufmanniana* 'Joseph Kafka' for one, delight in growing a bulb on a dropper sometimes 8 to 10 inches below the normal planting depth of 5 inches. The species are not gross feeders, and the addition of a good dressing of bone dust will provide all the nourishment they require. In fact, if the bulbs are planted in a pocket of sand, bone dust may be mixed with this.

The range of bulbs offered in New Zealand is very small due, no doubt, to the fact that the species do not increase with anything like the rapidity of the 'Dutch tulip', except, perhaps, the variety *fosteriana* 'Defiance'. So one has to import, and the most important factor is to attempt to create conditions similar to what the bulbs would experience were they being planted in the northern hemisphere. Bulb catalogues usually reach New Zealand about September, and where once I used to order immediately, and receive the bulbs in early December, which is well past their normal planting time, I now contain myself in patience and send away about March the following year. This means that the order will be sent out immediately the bulbs are lifted, and will arrive in October, having travelled out during their period of comparative dormancy when the changing climatic conditions will not affect them so much. This year I am having them sent by air mail, and while the expense is much greater, the bulbs should 'turn around' better with the longer growing period, as they will be planted here in September.

This is the method which has given me the best results once the bulbs arrive. I have ready for them a mixture of two parts friable soil and one of sharp sand. They are planted two to a 7-inch pot, and buried in a cool shady position on the south side of the house, or even under an evergreen shrub facing south, so that the rim of the pot is about 4 inches below ground level. They are left there until late March or early April, supplied with sufficient moisture to keep them growing until they start to rest, and all flower buds removed as they appear.

Their autumn and winter quarters are in the sunniest part of the garden, where this time, they are planted with the rim of the pot at ground level. According to the season the bulbs are removed from the pots about October, when they are dormant, and kept in a warm dry cupboard to be replanted about late December or early January; they will then come through perhaps a little earlier than established bulbs the following spring, and in some cases I have had them flower. Here may I sound a note of warning. Don't be disappointed with the first flower, as it has been my experience that the true colour is not seen until the variety has flowered once or twice, and it has become acclimatised. Rather than import a lot of one variety, I make a point of procuring two of each, both as an insurance against the loss of one, and also due to the fact that with the breaking up that occurs, two bulbs can provide quite a nice little 'family', as representative of the type.

Instructions on paper always appear very difficult, but from the foregoing it is evident that both in growing and importing tulip species the one essential point is this. They are not a 'cultivated' bulb in the degree that most bulbs are, and whoever grows them must have this thought in mind 'Am I creating for them something like their native conditions?' Bear this in mind and you will be amply rewarded. Striping is unknown and tulip fire is very rarely experienced, but I make a practice for the sake of garden hygiene of spraying every ten days with a composite spray of malathion and thiram, as well as ensuring that all dying foliage is removed along with any seed heads which may appear. One other point of cultivation which is worthy of note, is the fact that where bulbs have to be lifted annually, they should be replanted at the latest by early March, or some varieties, particularly the *kaufmanniana* types will be blind the following spring. Perhaps one should mention what could be termed an 'off shoot' of the species, namely the Darwin Hybrid Tulips which have been evolved by crossing Darwin tulips with the species. These flower when the species, which with me provide colour from August till the end of September, are going off. They can be grown in exactly the same way as the Dutch tulips, seem to be free from striping, and provide a really dashing display of colour.

Tulipa species must be planted in a sunny aspect, as the warmth of the sun is necessary for the flowers to open and display their full beauty. While the species of *Tulipa* are very deserving of a place

in any garden I have found that some have special appeal to me, whether it is from their dainty form, colour, or startling size.

Among the first to flower in mid to late August is *biflora*, best described as being no bigger than a threepenny piece when opened; colour is basically off-white, produces 3 to 5 flowers from one bulb and increases fairly quickly. Of universal popularity are the *kaufmanniana* types. For sheer brilliance of colour, I would recommend the hybrid 'Joseph Kafka', deep yellow red rim in the centre, and red streak on the back of the petals; foliage green mottled brown. Flowers are carried on 5 inch stems, are long lasting, and of good substance. A very vigorous grower and quite good increaser. This one is quite a contrast to the tiny *T. biflora* mentioned, and for a change of colour *T. kaufmanniana* 'The First', flowering about the same time, produces a long pointed flower, cream with yellow base, and light red on the outer petals. As these two *kaufmanniana* varieties lose their petals some of the pink ones come into bloom; my present favourite being 'Lady Rose', a large pale peach flower carried on a stem about 8 inches tall, and set off admirably by the large green leaves. 'Racine' is a deeper pink with a faint white margin, and a yellow centre provides a flower with a difference and will long be a favourite with those who grow it. Two varieties which increase very rapidly are 'Scarlet Elegance', three to five medium-sized bright red flowers with clear yellow zone is a 'must have' and 'Shakespeare', which is a blend of salmon apricot and orange to provide something really different.

For purity of colour 'Gluck', is a pale yellow with a camine outer petal and brown flecks within; there is the added attraction of brown flecked foliage. To give the real 'water lily' effect 'Gaiety' is best seen fully open on a sunny day with the pure white of the inner petals showing at their best, and, due to the short stem, the flowers rest on the foliage. Many and varied are the yellow and red varieties such as 'Caesar Franck', 'Aurea', and 'Vivaldi', all being similar but flowering at different times and providing the continuity of bloom.

As August passes and we come to mid-September, some of the really large flowered *fosteriana* varieties make their presence felt. 'Red Emperor' is too well known to require description, but its white form known as 'Purissima', or 'White Empress', is most striking. Carried on a 16 inch stem, the flowers, which sometimes reach the impressive size of 10 inches when fully expanded, make this one a collector's item. Not so large as 'Red Emperor', but very free flowering are 'Defiance', red with a clear yellow centre, 14 inch stem, and a terrific increaser; 'Feu Superb', a bright orange scarlet with lime green centre on a 16 inch stem; 'Princeps', a large clear red on a stem 6 to 8 inch is very much at home in a rockery and the little known 'Rockery Beauty', can best be described as 'Red Emperor' reduced to rockery size.

Before describing some of the smaller varieties — the real gems — I must point out that the largest flowering variety I possess at the

moment is 'Tubergeniana', a huge red flower with black centre on a thick 18 inch stem, associated with massive foliage.

As the flowering season ends *T. persica* a small yellow variety, 3 to 5 flowers on a stem, carmine outer petals, is beautiful on a sunny day when the clear yellow inner petals make a very cheerful picture. Three types which flower almost at ground level are *batalinii, batalinii* 'Bronze Charm' and *linifolia,* yellow, bronze and red respectively. Grow these side by side for the best effect.

If you want scent, try *T. sylvestris,* clear yellow and fragrant and so easy! A complete colour break will be provided by *T. clusiana,* which must have a warm spot and will then send up from its delicate foliage, a white and red flower, with a deep purple centre on an 8 inch stem. A challenge is provided by *T. saxatilis,* which must have a real summer baking and its roots confined before it will send up its 14 inch stems bearing up to three violet flowers.

The following table provides a record of *Tulipa* species and varieties I have grown and the dates of flowering in 1962 season:

Species or Variety	Time of Flowering	Description
batalinii	22/10/62	Pale yellow flowers on very short stems. Bulbs sink, so should not be left in ground for long periods.
'Bronze Charm'	4/10/62	Flowers similar to type but bronze predominating. Very short stems. Treat as for type.
bilflora	20/ 8/62	Three to five tiny flowers on a stem. White centred yellow. Free flowering and increases rapidly.
celsiana	29/ 9/62	Intense yellow with red reverse. Flowers fully open early in the day and make a lovely show. One of the best and good increaser.
chrysantha	29/ 9/62	Small yellow flowers with red reverse. Narrow grey-green foliage.
clusiana	14/ 9/62	Small white flowers on tall stems. Rosy red reverse, purple centre. Requires warm situation.
eicheri	17/ 9/62	Scarlet flowers with grey reverse; pointed petals. Good grower and increases well.
fosteriana 'Defiance'	22/ 9/62	Medium sized flowers of scarlet with yellow centres. Increases rapidly but splits up badly if left down.

'Purissima'	12/ 9/62	White form of 'Red Emperor'. Large cream flowers on tall stems. Very prolific. Outstanding.
'Red Emperor'	8/ 9/62	Large flower of intense red; tall stems. Must have good drainage.
'Rockery Beauty'	14/ 9/62	Dwarf form of 'Red Emperor' but slow increaser. Long lasting.
greigii	20/ 9/62	Large scarlet flowers with tall stems; shy bloomer. Beautifully marked foliage.
hageri	5/10/62	Curious copper and green flowers. Has acclimatised well. Collector's item.
hageri 'Splendens'	6/10/62	More colourful than above; very prolific. Has eleven petals per flower.
kaufmanniana	31/ 8/62	Cream with pale red reverse; medium sized flowers.
'Aurea'	26/ 8/62	Yellow petals with red reverse; varies in the interior markings, some being deep red, others pale; tall stems (for this species); increases well.
'Brilliant'	8/ 9/62	Attractive medium red flowers with yellow centres. Inclined to fade in strong sunlight. Has much to recommend it.
'Cesar Franck'	26/ 8/62	Deep yellow with red outer petals; tall stem; grey-green foliage.
'Coccinea'	10/ 9/62	Bright red with yellow centre. Increases from seed only.
'Gaiety'	11/ 9/62	White with yellow centres; lovely.
'Gluck'	16/ 9/62	Pale yellow with chocolate centres and carmine outer petals. Attractively marked foliage.
'Joseph Kafka'	27/ 8/62	Intense yellow and red flowers of good substance; well marked foliage. Bulbs tend to sink so must be lifted annually.
'Lady Rose'	31/ 8/62	Large soft pink flowers on tall stems; pale green foliage. Slow increaser.

kaufmanniana			
	'Primrose'	9/ 9/62	Pale cream flowers larger than type.
	'Racine'	12/ 9/62	Large white flower; white inside with faint pink flush; strong pink marking on reverse.
	'Scarlet Elegance'	30/ 8/62	Three to five large scarlet flowers with yellow centres on 5 inch stems; ready increaser.
	'Shakespeare'	9/ 9/62	Small salmon orange flowers on short stems. If left for more than two seasons will sink to over a foot and split.
	'Sparkling Eyes'	12/ 9/62	Unusual blend of yellow, brown and orange. Well worth growing but not very vigorous.
	'The First'	26/ 8/62	Large ivory coloured flowers, with yellow centres and crimson outer petals.
	'Vivaldi'	9/ 9/62	Flowers primrose with pink reverse and centre of yellow, red and brown on 7 inch stems. Distinctly marked foliage.
linifolia		22/10/62	Red flowers on creeping foliage.
ostrowskiana		22/10/62	Orange scarlet flowers of small size on tall stems. Similar in form to a lily-flowered tulip.
praestans	'Fusilier'	14/ 9/62	Three to five small orange scarlet flowers on short stems. Very prolific and suitable for the rock garden.
	'Regel's Variety'	28/ 9/62	Medium sized red flowers on foot stems. Good increaser.
	'Tubergen's Variety'	22/ 9/62	Similar to 'Fusilier' with less intense colour.
sylvestris		9/ 9/62	Several clear yellow flowers on 12-15 inch stems; faintly scented; narrow pale green foliage. Vigorous but likes warm situation.
	'Tubergeniana'	22/ 9/62	Huge flowers of red on tall stems. Colour not so intense as in other varieties. Too large for rock garden.

I think a fitting end to this article would be an acknowledgement to two people who have given me much help and encouragement in building up my ever-growing collection of much admired tulips. Mr. K. H. Marcusson, of the Department of Agriculture, Christchurch, and Mr. A. W. Anderson, the well-known garden author of Timaru.

FROST SURVEY — CHRISTCHURCH AREA.

W. R. SYKES (Christchurch).

One of the most annoying hazards that gardeners, in such countries as New Zealand, have to face is the unseasonable frost. This phenomenon also occurs in many other temperate regions, e.g., many parts of Europe and North America. Thus, in the early morning of November 7th, 1963, many parts of the South Island suffered from a sharp frost which caused considerable damage coming, as it did, in late spring. Temperature figures recorded around Christchurch were; Harewood Airport (west of the city) minimum air temperature, 31.5°F. at 4 feet above the ground, i.e. screen reading. Minimum ground temperature, 24.8°F. At Lincoln College (south of Christchurch) minimum air temperature, 28.0°F. at 4 feet above the ground. Minimum ground temperature, 19.3°F. In Christchurch Botanic Gardens the minimum air temperature was 30.0°F. at 4 feet above the ground. Minimum ground temperature 26.3°F. Thus, the damage suffered was very erratic over the district, but the frost was generally held to be of unusual severity for the time of year.

Returning home from a short holiday a few days afterwards I was greeted by such depressing sights as mature walnut trees with the outer leaves blackened to the tops. Upon closer inspection of the garden a number of other affected plants were seen. Some were naturally more badly affected than others, whilst a number which one might have expected to have been damaged were not. During the following week other gardens in the neighbourhood were visited, and I drew up a list of damaged plants; the degree of damage was also noted, and many of the unharmed plants listed as well. The area mainly concerned was just south of the Christchurch City boundary, observations being made especially at Lincoln College and the author's garden at Prebbleton, 5 miles nearer Christchurch. The frost was of approximately the same severity in these districts and the damage was similar. In this account, unless otherwise stated, the plants were young and thus not very high above the ground. Also, they had young spring growths, were exposed to at least some direct radiation from above, and were not against a wall. A slight movement of air took place from the N.E. and, in some of the most exposed sites at Lincoln, damage was observed on the south side of a plant only.

As expected, the herbaceous plants damaged included tomatoes, potatoes, runner and dwarf beans, dahlias, zinnias, French and African marigolds (*Tagetes* species) and garden nasturtiums (*Tropaeolum majus*). It is interesting to note that all these common plants originated from tropical and sub-tropical regions in the mountains of Latin America. These plants are well-known frost indicators in the young stage and cases of damage were even reported from the Port Hills, where there is always less frost recorded. It was among the woody plants that the most interesting results were obtained. In practically all cases damage was confined to the recently-produced shoots, so that older shoots and mature leaves of evergreens were unharmed. In certain instances it was ap-

parent that the very youngest leaves were unharmed, the slightly older ones damaged but the nearly mature leaves less damaged or unscathed. This was seen clearly on a young plant of the climbing *Jasminum polyanthum,* where the internodes quickly elongate as is the case with many climbers. This is not a new discovery, of course, and it can be explained by the varying concentrations of solutes in the cells of differently aged leaves.

To group the woody plants according to the damage suffered was my next aim. Thus, I found myself considering a possible pattern in the results. Why were some unexpected plants hit such as a hedge of common laurel, *Prunus laurocerasus,* and an English holly, *Ilex aquifolium?* Conversely, why did such pants as *Acacia cultriformis* and *Polygala myrtifolia* come through unscathed? In all cases young shoots were present on equally exposed plants growing in the same garden. Thus, one concludes that the young tissues of the Southern Hemisphere plants must be more cold resistant than the Northern Hemisphere ones. This seems surprising on the surface because one assumes that the two northern plants mentioned would have to encounter colder weather in the spring than their southern counterparts. Certainly, in the cold Canterbury winter it is the *Acacia* and *Polygala* which are liable to succumb. The reason for this seeming reversal of hardiness may be found in the fact that the latter plants have marked drought resistant properties. It is known that drought resistance and cold resistance are achieved by similar mechanisms in the cell. Therefore, a possible answer may be that, in such plants as many acacias and *Eucalyptus,* the resistance of young cells to drought means that some frost hardiness is achieved as well.

A more likely explanation may be sought in the fact that the Southern Hemisphere plants in question have a different growth pattern in cultivation on the Canterbury Plain as compared with that in their natural state. Many of them come from areas of Australia and South Africa where the winters are much wetter than the summers. Thus, providing the winter is not too severe, a certain amount of growth is possible at this period. However, the regions under consideration are not necessarily frost-free, and it is possible that the young shoots of such plants as many acacias and *Eucalyptus* would therefore be able to withstand the moderate frosts which might be a not too uncommon feature of their growing season. In Canterbury the severe winter ensures that little growth takes place until the spring.

As indicated above, the Australian and South African plants came through with very little damage. Of course, a limited range of species from these countries can be grown on the Canterbury Plains, but enough were present to show that it is not the late spring frosts which prevent many more from being cultivated. Low-growing *Arctotis* and *Gazania* species, a few South African *Erica* species, very young plants of *Prostanthera rotundifolia, Eucalyptus leucoxylon,* and several other *Acacia* species, were all quite unharmed in the open at Prebbleton. However, ex-

ceptions can usually be found in biology, and an odd plant of *Callistemon* suffered damage, whilst some species of *Pelargonium* were affected.

Turning to our native plants I found that they had come through reasonably well. The North Island *Hebe* species and varieties seemed virtually untouched, but I was surprised to see that *Griselinia littoralis* and its variegated clone were blackened at the tips. At Lincoln College quite large plants of *Neopanax arboreum* were damaged, and in a very cold place a small *Pittosporum eugenioides* was browned on top. There were other cases in certain genera, especially with plants native to wetter forest areas of the country, but the majority observed were unharmed and suffered no check in growth. Incidentally, the damage reported from this widespread frost included some to the native vegetation in more inland areas of Canterbury where shoots of *Coriaria* species were killed and the mountain beech *Nothofagus solandri* var. *diffortioides* was even affected. A country with many floristic links and climatic similarities to New Zealand is Chile. Since many of our cultivated Chilean species come from areas with climates similar to western parts of this country, they can be expected to be rather susceptible to frost. Thus, more damage was observed to Chilean plants than to those from any other region of the Southern Hemisphere. The hardiest species of *Fuchsia, F. magellanica,* was severely cut back in some cases where the growth was lush, as was our native *F. excorticata. Crinodendron hookerianum* (syn. *Tricuspidaria lanceolata*), *Desfontainea spinosa, Mitraria coccinea, Berberidopsis corallina,* were all damaged to some extent. Even *Berberis darwinii* was slightly damaged, but strangely enough, fresh growths on a young plant of *Embothrium coccineum* were untouched.

However it was when I turned to the Northern Hemisphere plants that I found the main damage. I have already mentioned *Ilex aquifolium* and *Prunus laurocerasus.* Also from southern and western Europe are *Arbutus unedo* (the common 'Strawberry tree'), *Spartium junceum, Taxus baccata* (Yew) and *Acer pseudoplatanus* (ordinary sycamore). These all suffered damage, none of it severe. The evergreen shrubs of the Mediterranean maquis and its Californian equivalent, the chaparral, came through quite well. Tips of *Myrtus communis* were blackened, but *Capparis spinosa* (the 'caper' plant) *Convolvulus cneorum, Cistus* species, *Dorycnium* species, and the American *Ceanothus* species and *Arctostaphylos manzanita* were more or less untouched. Deciduous species from the Mediterranean and Middle East such as *Castanea sativa* ('sweet chestnut'), *Cercis siliquastrum, Punica granatum* (pomegranate), and *Vitex agnus-castus,* showed more damage, especially the last mentioned.

From China and Japan come many of the commonly cultivated trees and shrubs in Canterbury. Some of these were unharmed and some were severely damaged. Around Christchurch generally, *Camellia japonica* was one of the major casualties of the frost, young growths being completely killed. Strangely *Camellia sasanqua* was less severely affected and *C. reticulata* least of all. This pattern was likewise well in evidence in the Christchurch Botanic Gardens. Asiatic magnolias were damaged, includ-

ing the well known hybrid group of *Magnolia* x *soulangeana*. Mature specimens of the *Magnolia sinensis* (Oyama) group were damaged a little in the Botanic Gardens, and young plants of *M. wilsonii* were damaged in a shade house at Lincoln College. A recent favourite, *Osmanthus delavayi*, was caught, and even young shoots of the hardier and more vigorous *Osmanthus heterophyllus* (syn. *O. aquifolium*), were badly hit. Another evergreen Chinese plant to become popular recently is *Mahonia lomariifolia*, and this received damage at Prebbleton amounting to the loss of about half the new foliage. *Ligustrum lucidum* and *L. sinense* were damaged to a minor extent. I must not forget the *Ericaceae*, because rhododendrons suffered quite badly in some cases. *Pieris* species were hit, particularly *P. forrestii*. Plants of a similar type from North America, such as *Kalmia latifolia* and the taxonomically unrelated *Myrica cerifera* were damaged.

In my opinion the worst damage was suffered by the deciduous plants native to temperate Asia and east North America. Many of them come from inland areas with a more continental type of climate, and it seems that such plants, which are often late coming into growth, have little cold resistance in their young tissues. A long hot summer is needed to ripen the wood properly and then they can withstand cold winters, at least by New Zealand standards. Many such plants are Chinese and it seems that they are unlikely to suffer unseasonable frosts in nature. Examples which readily come to mind are *Broussonetia papyrifera* ('Paper Mulberry'), species of *Catalpa, Clerodendron trichotomum, Diospyros* (3 species), *Ficus carica* (edible fig), *Hibiscus syriacus, Idesia polycarpa, Paulownia tomentosa* and that peculiar-looking distant relative of the barberries, *Decaisnea fargesii*. Last, but not least, the common walnut, *Juglans regia*, was badly damaged as I stated at the beginning. Climbing plants in this group suffered badly, especially members of the *Vitaceae*, including *Vitis vinifera*, the grape, and the Manchurian *Vitis amurensis*. The Chinese gooseberry, *Actinidia chinensis*, was another casualty, but *Campsis* x *tagliabuana* was only damaged a little. It would have been interesting to have had the parents to compare with the hybrid and each other.

Certain genera native to one or more of the above regions showed virtually no damage, e.g. *Viburnum* species, *Syringa* species and cultivars, deciduous *Prunus* species, including the more tender *P. campanulata*. In fact, the *Rosaceae* as a family suffered very little indeed and it was only where roses were pruned very late that they were at all affected. The south central Asiatic *Albizzia julibrissin* was unharmed, possibly because the fresh shoots were still extremely young. The shrubby grey-leaved *Chrysanthemum, Centaurea* and *Senecio* species, often used in bedding schemes, were all untouched at Prebbleton. Finally, a few oddly contrasting cases serve to throw into sharper focus some of the points raised above. *Hydrangea macrophylla*, the species including the ordinary garden hydrangeas, was quite badly cut in many cases whilst equally young growths on *H. quercifolia* were unharmed. *Cotinus coggygria* (syn. *Rhus cotinus*)

seemed to be more or less unharmed, but its otherwise hardier relative *Rhus typhina,* was damaged. Young shoots on some of the ericas were killed and all those which were so affected proved to be European species. This was a good test since the main observations were carried out in a nursery bed at Lincoln College where a large number of small plants of European and South African heaths were growing together. Another particularly striking case was seen at Prebbleton where a plant of *Cassia tomentosa* was standing near a hedge of *Rhododendron ponticum.* The young shoots of the latter almost touching the *Cassia* were crippled, and even some under partial cover were damaged, whereas all the young *Cassia* shoots were unscathed. I should like to repeat that in the above account, unless otherwise stated, I have tried to take into consideration as far as possible, only those plants which were of comparable size, with young spring growths, and which were growing in comparable situations.

The question of acclimatisation is a natural one to raise when considering frost damage. While it is true that some degree of adaptation must take place in view of the fact that many of our cultivated plants grow in widely differing environment to their natural homes, including many New Zealand plants cultivated in Canterbury, it is my opinion that the results given in this account show that acclimatisation in the real sense has definitely not occurred. A pointer to this being the case seems to lie in the fact that the damage was so variable in different species, and there was certainly no correlation with the length of time a particular species had been in cultivation in this country. Furthermore, one would expect that true acclimatisation would have a genetic basis. But the majority of plants mentioned here are woody species which are propagated vegetatively, with a minority being raised by seed from necessarily infrequent generations. Thus, selective mechanisms can probably be discounted as a major factor in the plants under consideration, the short time in cultivation being one reason. Therefore, I believe that this short survey does show some interesting facts relevant to the origin or background of the species concerned.

THEY LIKE WET FEET.

DOUGLAS ELLIOTT (New Plymouth).

Every so often some gardener tells me rather ruefully that part of his garden is so low-lying and boggy that he doesn't know what to do with it. He looks startled when I tell him I envy him. I have to hasten to explain that he has just the place for many lovely plants that like to have wet feet and that usually have to struggle to make a passable display in normal ground.

Of course the way you deal with this swampy area will depend on its size and the size of your garden. If you have plenty of space you can really let yourself go, make a pond, and plant some of the fine wet-soil trees together with many perennials that like to dabble their feet in the

bog. In confined space you'll have to be content with shrubs and perennials or perennials alone.

The trees and some of the large-leafed perennials such as *Gunnera manicata* will help to dry out the wet soil by taking up gallons of water through their roots and sending it off into the air through their leaves. A large tree can transpire many gallons of water on a summer day.

In really wet ground where water lies the year round the making of a pool is simple. It calls for hard work of course but there will be no need for a concrete lining to hold the water though a concealed concrete edge — hidden by plants, lawn or rock — might be useful in keeping the water from spreading where it's not wanted.

Stepping-stones, steps, and possibly a bridge are some of the features that will add very definite interest to such a garden. Try to arrange for at least one path to give through access. A 'no exit' path can be frustrating and inconvenient, especially if you are showing several people round your garden at once.

As usual with planting, let's start with the trees. One special favourite of mine is the swamp cypress (*Taxodium distichum*), which is much like the dawn redwood in appearance, in its foliage, and in being deciduous. It will grow right in water.

An excellent tree for autumn colour is *Nyssa sylvatica,* a native of eastern North America where it grows mainly in swamps and badly drained land. The only specimens I have seen have been about 12 ft. high and it is slow growing but according to the books, is capable of reaching a height of 80 ft.

Weeping willows look well near water and grow in wet soil though they don't demand it as an essential. I prefer the weeping golden willow (*Salix vitellina* 'Aurea') because of its beautiful yellow bark. It also has quite showy yellow catkins in the spring. We have one in our non-boggy garden and it is a constant source of pleasure with its graceful branches which make a green tunnel in the summer. Like the common weeping willow it grows very easily and quickly from cuttings. One frightening thing about it is that it has the reputation of growing half as tall again as the ordinary weeping willow. The pussy willow (*Salix caprea*) also grows well in wet soil but in mild districts is inclined soon to become ragged through the attacks of borer. Poplars like moist soil but will usually be too big for our purpose, though I'd try to find room for *Populus serotina* 'Aurea,'

Along the banks of a stream not far from where I am writing is a very attractive tree which you probably know well, at least by name. It is the alder (*Alnus glutinosa*). It has quite attractive broad serrated leaves but before they appear the catkins open their yellow flowers and make a charming contrast with the dull brown cone-like seedpods still hanging on the branches from last season. This is favoured material in our house for arrangements.

For a small tree — or big shrub — plant the lovely golden elder (not to be confused with alder). The botanical name is *Sambucus nigra* 'Aurea.' I didn't know this very beautiful plant was grown in this country until I saw its golden leaves glowing in many roadside gardens in the Waikato. It is very leafy and makes a very solid plant. Like many other yellow-leafed plants it is most intensely coloured where the sun strikes it.

Surprisingly, *Weigela* (*Diervilla*) does well in damp soil. This is quite a win; for there are several good varieties from white to deep red and they all flower profusely during several weeks in spring. One of the most popular is the dainty *D. florida* 'Variegata' which stands out well with its soft pink flowers and cream-and-green foliage. These plants need fairly regular and drastic pruning to keep them tidy and vigorous. Cut back to the base every year or so the old stems that have flowered. Another shrub you might not expect to like wet soil is the good old-fashioned mock orange (*Philadelphus*). There are many varieties and if you have the right ones you can have them in flower from September to December. The flowers are white or cream and very strongly scented. Unfortunately the demand for mock orange is so small that nurseries, in the North Island at least, seldom stock any but the semi-double 'Virginal,' a variety of *P. lemoinei*. The plants require the same sort of pruning as weigelas.

The snowball, *Viburnum opulus* 'Sterile,' is another old-fashioned large shrub or small tree that does well in moist soil. Its arching branches look well beside a pool. It is of course grown mainly for its showy white hydrangea-like flowers but in cold districts its leaves shiver from green to a beautifully soft pink in the autumn.

Spiraeas are easy-going but some of them do at least seem to have a preference for putting their feet in moist ground. Here again few of the many kinds available in England and the U.S.A. are stocked by New Zealand nurseries. In representative catalogues from both islands I could find only four kinds. Easiest to buy is *Spiraea japonica* 'Anthony Waterer,' which has large flattish flower-heads of small bright carmine blossoms with prominent stamens. If you cut the flowers as soon as they fade you can keep the plants flowering until autumn. Some of the shoots have a habit of becoming prettily variegated. *S.* 'x Vanhouttei' has arching branches which in spring are laden with 2-in wide clusters of dazzling white flowers like hawthorn. Two others sometimes listed are *S. media* (syn. *confusa*) and *S. thunbergii*. Fairly commonly grown in old gardens is a dainty double white with very arching branches. This is probably *S. prunifolia*.

Two grasses that do well in moist soil are bamboo and pampas grass. Both need plenty of space and the pampas grass and some species of bamboo can become pests. We mustn't overlook our native flax (*Phormium tenax*), which will grow on a sniff of salt spray and fish at the top of a cliff but which is happiest in swampy soil. Although the common green type is much used overseas, here in New Zealand

we can afford to be more choosy and plant the very handsome variegated forms and the bronze.

The giant Brazilian, *Gunnera manicata,* looking like a monstrous rhubarb, is almost as much a part of a bog garden as a handle is of a spade. When it becomes established its leaves are enormous, so allow it plenty of space when you plant the comparatively small chunk of root that is all you'll get when you beg a piece from some friend; for I don't know where you can buy it. The large reddish flower-spike looks more like a weapon than a decoration.

When it comes to small perennials there is a wide choice. Many of them are extremely beautiful and a few will grow successfully only in moist soil so that bog gardening becomes a new adventure. There are so many bog plants that it is impossible to describe them all here and I suggest that if you want a full list you should consult *Water Gardening* by Frances Perry. Her list will doubtless be tantalising because it includes so many plants that are not on the market here; but many of them are grown in gardens and the book will, if it does nothing else, give you an idea of what to look for. It will also show you what dry-land perennials may be successfully used in wet land. There are many of these amphibians. *Hemerocallis* (day-lily) is one example, *Lythrum salicaria* another. And you will also learn that some of the plants you've grown perhaps not very successfully in the well-drained garden, should actually have been in the bog. The stately and brilliant scarlet *Lobelia cardinalis* is one.

Probably the most obvious and easy-to-get bog plants are Japanese iris and astilbes (usually called spiraeas). The astilbes are excellent because they have very pretty leaves, some varieties being reddish; their flowers in feathery spikes come in all shades of pink and red as well as white. Less well known are *Trollius* (globe flower), which is like a giant buttercup, *Hosta* (plantain lily), *Trillium, Ligularia clivorum* (syn. *Senecio clivorum*), and *Hibiscus moscheutos,* a herbaceous species. The *Hibiscus* is another example of the plant you may have grown in a hot dry position simply because that is where the tropical *Hibiscus rosea-sinensis* is most at home. But its common name of swamp rose mallow gives us the clue we need. I don't know any nurseryman who stocks this very fine plant now so it's another you'll have to put on your cadge list.

Some of the lilies do well in moist soil but here again we come up against a shortage of available species. However, one moist-soil species, the panther lily (*Lilium pardalinum*), is listed in one catalogue.

So that you shan't feel too frustrated by the mention of plants that can't be bought from nurseries in this country, let me hasten to tell you that you can buy the seeds of some of them and these are not difficult to import from overseas. No bog garden would be complete without primulas and these are offered in many kinds by English

seedsmen. Get seeds of such species as *japonica, helodoxa,* and *pulverulenta.*

Your bog garden is obviously going to be an informal affair and this gives you plenty of scope to use plants that are a little on the wild side. This applies especially to ground cover. Plant broad swathes of such things as the blue-flowered bugle (*Ajuga reptans*), *Parochetus communis* (shamrock pea), our native *Pratia angulata,* which has pretty white flowers followed by purplish red berries, and Kenilworth ivy (*Cymbalaria muralis*), a dainty thing with small mauve linaria-like flowers that grows like a weed in some gardens.

The plants I have mentioned — trees, shrubs, perennials, and ground-cover — are just a few of the many that like wet feet.

THE BEACH PLUM IN AUCKLAND.

By A. FARMER, Fruit Research Division, Department of Scientific and Industrial Research.

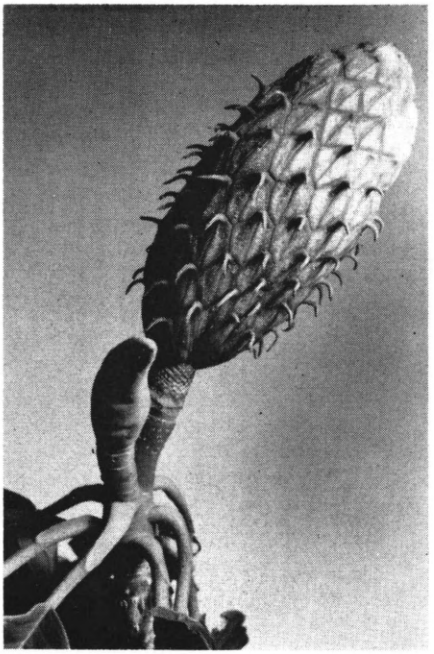
The beach plum (*Prunus maritima* March.) is, as its name implies, a plant that grows naturally by the sea. It is native to North America, where it is particularly abundant along the coast and among the sand dunes from Virginia to as far north as New Brunswick, Nova Scotia. Early explorers of the New World found that this wild 'blue plum' or as it is now more often called the 'beach plum', was almost inedible raw, but could be cooked. In the Cape Cod region of Massachusetts the making of jam and jelly from beach plums has since become an established industry.

It is not known when the beach plum was first introduced into New Zealand. Since World War II there has been considerable interest in the possible use of *P. maritima* as a dwarfing rootstock for stone fruit and it was mainly for this reason that the Fruit Research Division imported seed, and, more recently, named varieties of this plum species from U.S.A.

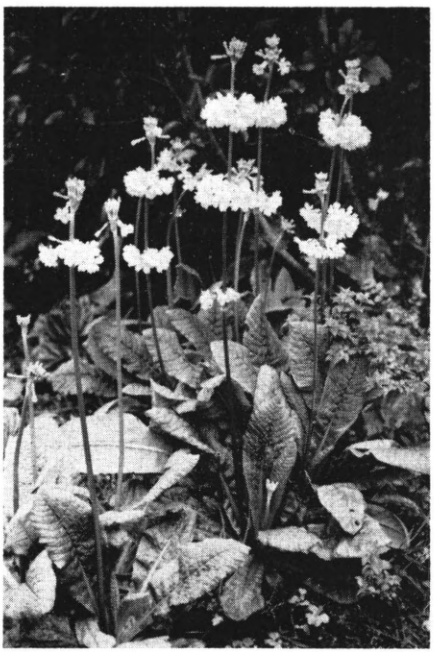
Beach plums are much different from the Japanese plums (*P. salicina*) or the European plums (*P. domestica*). The beach plum tree is much smaller and the fruit is smaller and more astringent than either Japanese or European plums. It is because of their small size and astringency that beach plums can only be considered a culinary type fruit. Other kinds of stone fruits grown only for culinary purposes are sour cherries (*P. cerasus*) and damson plums (*P. insititia*).

Both seedlings and named varieties of beach plums have thrived on inland soils round Auckland, and in particular on the lighter volcanic soil types. They appear to be able to resist drought yet at the same time they will tolerate considerable soil moisture.

Magnolia obovata
(See page 313)
(photograph Douglas Elliott).



Seed Cone of Magnolia obovata
(See page 313)
(photograph Douglas Elliott).



Primula helodoxa (orange flowers)
(See page 303)
(photograph Douglas Elliott).

Astilbes
(See page 302)
(photograph Douglas Elliott).

THE BEACH PLUM IN AUCKLAND.

(photographs — J. W. Endt).

Fig. 1. Beach Plum, planted 18 months (See page 304)

Fig. 2. Blossoms
(See page 304)

Fig. 3. Fruit crop
(See page 304)

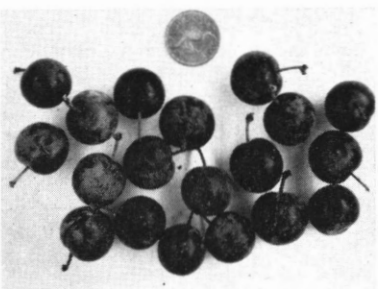


Fig. 4. Sample of fruit
(See page 304)

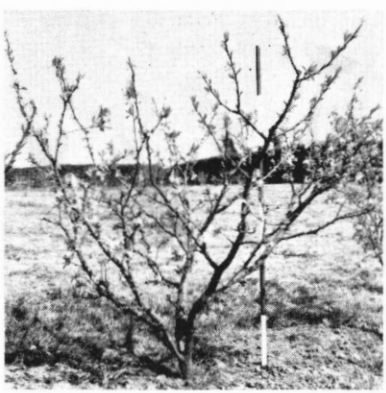


Fig. 5. Plum 'Sultan' on P. maritima stock. (See page 305)

Fig. 6. Showing overgrowth of scion
(See page 305)

Attempts to establish beach plums on pure sand, near the coast, at Muriwai on Forest Service land with little protection from the wind were not particularly successful. However, seedlings planted in a more sheltered part of this forest area some 1½ to 2 miles from the coast but still almost in pure sand thrived and fruited in their third year. The fruits in this situation were thickly coated in dust which would be a nuisance if they were to be processed.

The natural form of the beach plum is a low sprawling or straggling shrub up to 6 feet in height (Fig. 1). It tends to spread by offshoots or suckers from soil level, forming clumps that often become almost a thicket. During summer the rather small soft ovate leaves are of two shades of green, being paler beneath. With the approach of Autumn they change to a bright gold and red or crimson hues. In winter the spreading outlines of the bare limbs have a definite character which is very pleasing. The wood of the older branches is vinaceous brown and the short lateral shoots or spurs arising from them are densely tomentose. Wood of current season's growth is a lighter chocolate brown overlaid with a grey scarf skin.

In Auckland the first flowers begin to open about the last week in September and bushes are usually in full bloom during the third and fourth week of October. Unopened flower buds on some seedlings are tinged greenish, others slightly purplish. These flower buds are produced mainly on wood laid down in the previous season. The flowers come before the leaves (Fig. 2) and although they are not strikingly coloured like many other species of *Prunus* the small plum-like flowers are borne in such profusion that they are really quite beautiful. In America they are sometimes cultivated for their display of bloom. The flowers which are white are rather small, ½-5/8th inch in diameter and they are usually borne in clusters of 2 or 3.

As is the case with most plum species the fruit set of beach plums is often increased when several bushes are grown in close proximity. They appear to need cross-pollination to set satisfactory crops. In Auckland the developing fruits begin to change colour towards the end of January or early February and ripen between the second and fourth week in February. As the fruit ripens it changes from green to yellow, to red, to blue, and finally to an almost bluish-black overlaid with a thick whitish bloom (Fig. 3). The fruit from different seedlings varies considerably in size, shape, colour, flavour and date of maturity. Occasionally a seedling is seen which produces yellow fruit with only a tinge of purplish red on the skin.

The largest of the fruits are ¾ inch in diameter (Fig. 4). They are roundish, with a shallow suture and shallow cavity. Their stems are comparatively long, slender and pubescent. The fruits on a particular seedling don't all ripen at the same time; this possibly makes the shrub more attractive, but more difficult for commercial

picking. The skins of the fruit are thick and slightly tough. The flesh is yellow, firm, fibrous and dry and generally austere and somewhat unpalatable. The stone is comparatively large, resembling a cherry stone in size and shape, and in most fruits it is slightly clinging.

The beach plum is usually propagated by seed. In the mild Auckland climate unless dormancy is broken by artificial means, the seed may take 2 years to germinate, for it requires a comparatively long after-ripening period. Seedlings can be budded with named varieties using the normal T-shaped incision and shield bud. At this station beach plums have also been worked on Myrobalan or cherry plum (*P. cerasifera*) rootstocks; this combination appears to be fairly compatible but after a few years the stock is inclined to overgrow the scion. Beach plums can be propagated by root cuttings and also by softwood cuttings treated with a rooting hormone. Softwood cuttings should also strike readily using the more modern mist spray technique.

At Mt. Albert Japanese plum (*P. salicina*) variety 'Sultan' has been successfully budded onto Maritima rootstock (Fig. 5). This bud union is mechanically strong, but after some years there is considerable overgrowth of the more vigorous scion (Fig. 6). Trees otherwise appear healthy and produce large, high quality plums. 'Sultan' trees on this stock grow only $\frac{1}{4}$ to 1/3rd as large as 'Sultan' on standard 'Myrobalan' plum rootstock. The size of the tree and the quality of the fruit are sufficiently promising to justify a range of *P. salicina* varieties and even other species of stone fruit being tried on this rootstock.

Three newly imported, named varieties of beach plums, under trial at the Mt. Albert Research Station are 'Stearns', 'Squibnocket' and 'Autumn'. They have not yet fruited. In addition four locally raised seedlings have been selected.

The beach plum is both an interesting and useful dual purpose plant, for in addition to producing small culinary fruits the plant is ornamental at all seasons of the year. It does seem to have a place in New Zealand gardens as an ornamental, and as a rootstock on which to grow small Japanese plum trees. It may be desirable in the future to develop some larger fruited hybrids from deliberate interspecific crossing.

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OUR NATIVE FERNS (1)

MARGUERITE CROOKES (Auckland.)

New Zealand is a country rich in ferns. It has ferns big and little, tough and delicate, simple and complex. They are to be found everywhere. Tropical species haunt the hot springs and warmer regions, while others again can endure the rigours of the sub-antarctic islands. Some flourish in forest or scrubland, while others face the sea spray on martime cliffs. They are found on high mountains and in bogs, and some can even be met growing in the water.

The largest and most striking of our ferns are undoubtedly the tree-ferns. They are found included in two genera. First we have the large genus *Cyathea* of about 800 species, of which we have 8 species including 2 from the Kermedec Islands.

The mamaku or Black Tree Fern (*Cyathea medullaris*) is the largest and most beautiful. It may be 60 fet high and have fronds 20 feet long and is extremely hardy. It is liable to spring up in quantity where bush has been interfered with, and sometimes old logging tracks can be traced by the line of beautiful plumed mamaku crowns. As the mamaku is very hardy it does well in the garden provided there is plenty of room. Smith's Tree Fern (*Cyathea smithii*) is smaller and the fronds are a lighter green while the dead frond stalks stand out round the stem after the manner of a ballet skirt. No other tree-fern penetrates so far south since it is to be found in the inhospitable Auckland Islands. Everyone knows the Silver King (*Cyathea dealbata*) so easily recognised by its white-backed fronds. Unfortunately it becomes ragged and untidy when grown in the open, so do not plant it without adequate shelter.

The genus *Dicksonia* is a small one containing only 7 species of which New Zealand has 3 which are endemic. They are small tree-ferns. The commonest, the wheki (*Dicksonia squarrosa*) reaches about 20 feet on occasion with fronds 4 to 8 feet long. The dead frond stalks do not form skirts but project upward from the trunk for about 9 inches. The wheki grows well in cultivation and as it has stoloniferous habits it will, under suitable conditions, produce an attractive clump. It has a close relative the wheki-ponga (*Dicksonia fibrosa*), which however, is not as a rule found further north than Tauranga. Its frond stalks are not dark like those of the wheki, and it forms noticeable 'skirts'. It is remarkable for the great masses of fibrous roots surrounding the stem so that this may be as much as 2 feet in diameter. The Maoris made use of this rat-proof material in constructing their food houses. Colenso tells how he noted an abundance of these beautiful ferns near a village and the poor things had been cut into all sorts of grotesque shapes. It does well in cultivation and may have 30 or more fronds. Another attractive *Dicksonia* is the Woolly Tree-Fern (*Dicksonia lanata*). This fern has no trunk or only a short one. It is stoloniferous, so may form clumps.

How does one distinguish these 2 tree-fern genera from each other? It is really quite easy. Look at the uncoiled frond. In *Dicksonia* it is protected by stiff bristly hairs. *Cyathea* crooks on the other hand are protected by flattened scales which may be 1/8 inch wide. The spore-bearing parts also differ. In *Dicksonia* the spore cases are in valves on the frond margin, indeed the margin itself forms one of the flaps. In *Cyathea* on the other hand, the spore capsules are collected into little groups well in from the margin and, before the protective covering bursts, these resemble little balls.

Tree-ferns are by no means the only large ferns in New Zealand. Readily grown in frost free areas is the beautiful King Fern (*Marattia salicina*) or 'para'. Its great glossy green fronds may be 13 feet long. They are not very fern-like being (usually) twice pinnate, the pinnae rather resembling those of an ash, hence its old name *M. fraxinea*. The fronds spring from a tuber-like mass of rhizome, and each one comes from a section shaped somewhat like a horse's hoof. These 'horse shoes' can be separated from the main mass and each can produce a new fern. A friend of mine once separated a large King Fern into about 20 different 'horse shoes' and stocked a whole gully with them, and it was not very many years before he had 20 splendid ferns. In the King Fern the tiny capsules containing the spores are not separated from each other, as is usual with ferns, but fused together forming the little boat-shaped structures one finds on the backs of the pinnae. Another very different but also large and handsome fern of the north is *Todea barbara* found only in the northern part of the North Island. It has stiff rather upright fronds up to 4 feet long. It often grows in clumps, and a large clump consisting of a number of crowns was found by one grower to produce 150 fronds. Closely related to *Todea barbara* is the lovely Prince of Wales Feathers or heru heru (*Leptopteris superba*) which unfortunately does not occur north of Te Aroha. It haunts damp woods which it beautifies with its exquisite fragile mossy fronds which may be 4 feet long and sometimes grow on a short trunk to 3 feet.

New Zealand not only grows large ferns, it can grow very small ones too. The Filmy Fern family (*Hymenophyllaceae* — from the Greek, humen, a membrane and phullon, a leaf) contains among its 28 odd species some extremely minute forms. Characteristically the fronds of filmy ferns are conspicuously delicate and membranous. Most species have creeping rhizomes which mat together so that rock and tree trunk are covered with these lovely little things. The mat habit helps them to conserve humus and is useful in that the overlapping of fronds assists in the conservation of moisture.

Armstrong's Filmy Fern (*Craspedophyllum armstrongii*) is certainly a midget, with a tiny often undivided frond not infrequently only about ½ inch long. It is not readily come by, since it usually grows high up on trees. More accessible is Lyall's Filmy Fern (*Sphaero-*

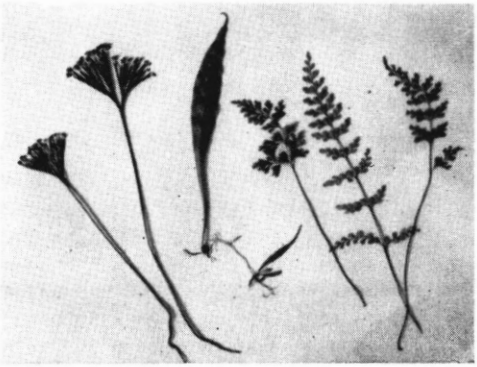
OUR NATIVE FERNS.

Mamaku (Cyathea medullaris) above; wheki (Dicksonia squarrosa) below.

(See page 306)

Some filmy ferns. Top row left to right, Mecodium sanguinolentum, M. dilatatum, kidney fern, M. dilatatum. Second row, Selenodesmium elongatum (two fronds), M. flabellatum (below kidney fern).

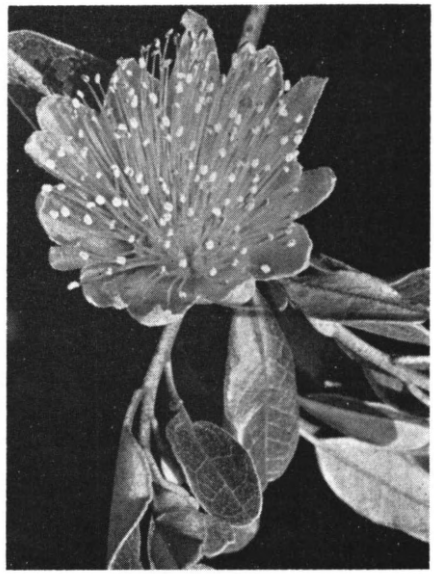
(See page 308)



Kauri Fern (Schizaea dichotoma) left; Anarthropteris lanceolata centre: Lindsaea trichomanoides right.

(See pages 309/310).

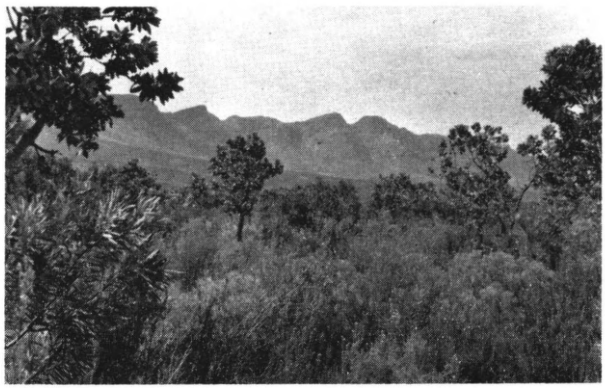
Hakea invaginata
(See page 314)



Diplolaena grandiflora
(See page 314)

Moisture loving plants including Protea grandiflora and Leucadendron sp. growing in Ceres district on winter rainfall side of the Bonteberg.

(See pages 325/326).



The King Fern or Para (Marattia salicina)

(See page 307)

cionium lyallii) forming mats with its delicate little fan-shaped fronds. It is very partial to the trunks of wheki (*Dicksonia squarrosa*). Also very small is the hardy little *Meringium minimum* found, except for a few localities, in the south and on Stewart Island.

Slightly larger is the Thin Filmy Fern (*Mecodium rarum*) (*rarum* means thin not rare) and the rather yellowish green *Mecodium flabellatum* whose rhizomes are characterised by tufts of woolly hairs, while *Hymenophyllum revolutum* is a filmy fern with a toothed margin. Two fragile tiny filmies of the group known as Bristle Ferns on account of the hair or bristle-like protecting structure which bears the spore capsules are the Veined Bristle Fern (*Polyphlebium venosum*), the only species whose veins branch in the individual segments, often found growing with Lyall's filmy fern and the rather narrow fronded Slipper Bristle Fern which favours very shady places. Among the medium sized filmies the Scented Filmy Fern (*Mecodium sanguinolentum*) is common; so is *Meringium multifidum* with its toothed, very narrow segments.

Not all filmy ferns are small. The family includes the striking *Mecodium dilatatum*, whose beautiful pellucid green frond may reach 2½ ft., the widespread piri piri, (*Mecodium demissum*) which grows on trees but is also ground loving and indeed may on occasion cover considerable areas. One of the loveliest of all filmies is *Mecodium pulcherrimum — pulcherrimum*, appropriately enough, meaning most beautiful. Unlike the filmies so far mentioned it is tufted not creeping. In the North Island it is found only in mountainous districts from Te Aroha southwards. The fronds sometimes reach 3 feet. Some filmy ferns have characteristic hairs. These include the Rusty Filmy Fern (*Mecodium ferrugineum*), rather small with a rusty-looking frond; the tiny reddish filmy fern (*Mecodium rufescens*) which is found between 1000 and 3000 feet, the large Hairy Filmy Fern (*Mecodium scabrum*) with its stiff bristly brown hairs, and the remarkable Maling's Filmy Fern with its star-shaped hairs and slatish gray or reddish brown frond, which has cylindrical, not flattened, segments. It is a local mountain fern much addicted to the kaikawhaka (*Libocedrus bidwillii*).

Finally we must not forget that well known filmy the Kidney Fern (*Cardiomanes reniforme*), which often extensively covers ground, tree trunks and branches with its intriguing clear green kidney-shaped fronds.

To transplant filmy ferns take some of the bark or substrate on which they are growing. If this is impossible and you have to peel off the matted clump, see that when you replant, the mat is firmly clamped down in its new home — if practicable use staples. Otherwise, if water can run down between the matted rhizomes and their new growing place humus will be drained away, and there is danger of your plant being starved to death. If you can transplant your treasure complete with rock or branch, or a really large piece of the substrate, that of course is the ideal thing.

We have other small ferns besides the widespread filmies. *Lindsaea* forms a very attractive group. We have 3 species. The little creeping *Lindsaea linearis* forms masses in moss in the scrub. It has small erect fertile fronds and prostrate sterile ones. Both are simply pinnate, that is have a single row of pinnae (leaflets) on each side the frond midrib. The charming *L. trichomanoides* has twice pinnate fronds and these make lovely bright green clumps in light bush. The exquisite *L. viridis* which is usually confined to damp stream banks, is one of the most perfect of our small ferns with narrow drooping bright green fronds and cinnamon coloured frond stalks. Lindsaeas are often tricky to grow, particularly *viridis,* but good leaf mould will probably solve the problem.

Schizaea, sometimes known as Comb Fern, form a very odd group. Two of our 3 species have rather rush-like stems crowned by little comb-like clusters of spore bearing parts. A third species, the Kauri Fern (*Schizaea dichotoma*), is both quaint and charming, the upper part of the small frond being fan shaped. It is sometimes to be found in the moss at the base of kauris, though it is somewhat local.

If you want something dainty, delicate and lacy to adorn odd corners of the fernery, or the angles of stone steps, you can't do better than the little Bladder Fern (*Cystopteris fragilis*). Actually it rather belies its second name for it flourishes mightily once established, spores readily and has an endearing habit of sending up tufts in all sorts of unexpected places.

Everyone loves maidenhairs and 2 of our 6 native species can justly qualify as small. Most loved is our Fine Maindenhair (*Adiantum aethiopicum*). It is a fern of somewhat open situations and does well in fernery or garden, its creeping rhizomes soon enabling it to make an attractive patch. The Diaphanous Maidenhair (*A. diaphanum*) has a small neat frond a few inches long with often three little branches the central one being the longest, each bearing rather close set leaflets lightish in colour. Its rhizome is tufted and it has a partiality for shady dry banks. Somewhat larger than the preceding species is the Rosy Maidenhair (*A. hispidulum*) which is a rather stiff tufted fern but has the merit of producing autumn coloured young ferns.

Quite small but not unattractive are our Rock Ferns, species of *Cheilanthes.* Two species, a few inches high with narrow fronds and rather deeply cut pinnae delight in rock crevices. Sieber's Rock Fern (*C. sieberi*) is readily distinguished from the Woolly Cloak Fern (*C. distans*) as the latter bears woolly hairs particularly noticeable on the unrolling crooks.

Among our small ferns, we have several whose fronds instead of being cut into consist of a single undivided leaf. The commonest of these is undoubtedly *Pyrrosia serpens.* The formidable first name comes from a Greek word, 'purros' meaning fire, and allusion to the buff colour-

ed matting of felted hairs found on the back of the frond. In some foreign species the hairs are more flame-like in colour, hence the name. Our fern is a persistent and enterprising climber, being just as happy on the introduced oak as it is on our native trees and rocks. Its small leathery fronds are fairly widely spaced with roundish sterile fronds and rather long and narrow fertile ones. It is extremely hardy.

Also with simple undivided leaves are our 4 speces of *Grammitis*. The commonest, Billardiére's *Grammitis* (*Grammitis billardieri*) does not creep but forms tufts on trees or on the ground. Its fronds are only a few inches long, while fronds of related species are even smaller. A very interesting little tufted fern, common on rocks and tree trunks in the North Island and in a few localities in the south, is a peculiar species confined to New Zealand. It has bright green pointed leaves with netted veins and rejoices in the name of *Anarthropteris lanceolata*.

Rather odd small simple leaved species are the Adder's Tongue ferns, which really do not look like ferns at all since the leaf does not coil in the manner characteristic of ferns. We have two species, the pedunculate Adder's Tongue (*Ophioglossum pedunculosum* and the small Adder's Tongue (*O. coriaceum*). The latter is fairly common in the South Island particularly in high country. Both species are annuals.

Finally we must deal with a small and most intriguing plant that certainly does not look like a fern at all. This is the lovely red *Azolla* (*Azolla filiculoides* var. *rubra*). It grows in colourful rosy patches on still pools or slow moving streams. The separate plants are not more than ½ inch to 1 inch across and float quite freely in the water.

GLADIOLUS TRISTIS HYBRIDS

T. T. BARNARD.

(This article is reprinted from the British Gladiolus Society's Annual 1963, by kind permission. Full particulars of membership of this long established Society are obtainable from the Hon. Secretary, Mr. J. G. Lord, 25 Kimpton Avenue, Brentwood, Essex)

For nearly thirty years now, I have been growing gladioli from the South-Western Cape under glass in England and for the last ten years I have been raising annually a limited number of hybrids from crosses between pairs of the eight or nine scented species in my collection.

My three small greenhouses can accommodate only some five thousand flowering corms, plus a few seed pans and a batch of second-year seedings. A limited area, a hard heart, and a handy incinerator are essential when dealing with a genus that hybridizes so freely and increases so rapidly.

All the Cape species, in my experience, hybridize readily and produce fertile hybrids. Some seedlings will flower in eighteen months; nearly all in two-and-a-half years. Vegetative increase varies considerably in different species, some producing only a few large cormlets, others a vast number of small spawn. The smaller spawn may take four to five years to reach flowering size and is never worth bothering about. By using the larger offsets only, it is easy to increase the stock of a selected seedling quickly enough.

My collection is managed with the definite object of supplying a quantity of scented cut-flowers throughout the early Spring from the end of February to the middle of April. The Iridaceous flora of the South-Western Cape starts into growth at or just before the Autumn equinox, and grows through the wet Cape Winter. All the scented species of gladioli that I have been growing here flower early in Spring. In South Africa they flower in August or September, in this country, once they are acclimatised, they therefore wish to flower in February and March. As Philip Miller discovered at his Chelsea Physic Garden more than two hundred years ago, seed of the Cape Irids should always be sown in the middle of August and the corms repotted when necessary from that time onwards, so that the whole collection is ready and growing by the Autumn equinox at the end of September; and that has always been the practice here. The plants are grown on throughout the Winter in conditions as 'cool and airy' as possible. For several years my greenhouses had no heat at all; but there is no doubt that the gladioli, as well as I, appreciate a frost-free house and their present turbo-heaters with their thermostats set at only 40°F.

I call my hybrids '*Gladiolus tristis* hybrids' because nine-tenths of them have *G. tristis* in their ancestry. All the hybrids are judged as cut flowers. This means that they must have reasonably stiff stems from twelve to thirty inches long, flowers of good even 'cleancut' shape, a colour or combination of colours that is pleasing both by day and by artificial light—and a scent. Whatever variety of *G. tristis* is used—I have used half-a-dozen, including the ordinary commercial var. *concolor*—the species gives to its descendants length and stem, good flower shape, and a heartiness and adaptability that are invaluable. However, it does tend to produce a large number of unscented offspring —the species is deliciously scented, but only in the evenings—and the pale cream or heavily grey-veined colouration which led Linnaeus to name the species *tristis* is very dominant.

My hybrids with strong all-day scent derive this character from other species: *G. carinatus,* the dwarf orchid-flowered species like *G. templemannii,* or, all too often, from *G. caryophyllaceus.* I write 'all too often', because the great pink 'Sand-lily', once known as *G. hirsutus,* has a scent which someone once described to me as 'haw-

thorn flowers steeped in ammonia' and which to my nose is definitely unpleasant to the point of nausea. This scent is remarkably dominant through generations of its hybrids. Sometimes, however, it becomes modified to a scent that is still strong, but pleasant; so I do not really regret having used this fine species.

The colour range of my hybrids is now very wide. Many of the *tristis*-dominated creams and yellows are very decorative cut-flowers. The lilacs, mauves, and purples of varied ancestry nearly all fail under artificial light, as only the deep violets and the reddest purples show up well at night. The most striking new colours are derived from one variety of that very variable species *G. carinatus*, in which the normal yellow ground colour turns orange or red as the flower expands. I have now a number of seedlings in which the buds emerge yellow and the open flowers turn brilliant orange, pillar-box red, soft 'plover's yolk', or deep peach. Many of these have long stems and well-shaped flowers; but only two, so far, combine these desirable attributes with a strong scent.

With interspecific hybrids—and some of mine now have five or six species in their immediate ancestry—seldom do the results of a deliberate cross achieve the desired combination of form, colour, and scent. Entirely new and unpredictable colours, scents, or flower forms appear, so that the annual judging of new seedlings is an exciting and exacting task. According to my records, I have usually retained fifteen to twenty per cent of seedlings flowered and these are further reduced or replaced in subsequent years. Of five hundred seedlings flowered in 1955 and 1956 from my first large sowing of hybrid seed in August, 1953, only eleven remain, including three that have received an Award of Merit from the R.H.S. These are now grown in blocks of 50, 100, or 200, and obviously on this scale I have not the room to grow on more than the best.

Perhaps a catalogue of the species I have used may be of interest to some members.

G. tristis in variety, but mainly the commercial variety and a collected concolorous cream form; *G. carinatus*, four varieties of this variable species; *G. caryophyllaceus* especially a good form originally received from the late Miss Stanford; *G. alatus*, *G. templemannii*, *G. ceresianus* var. (Bot. Mag. N.S. t. 104); three of the dwarf orchid-flowered species; and (but only sparingly) *G. grandis*, *G. gracilis*, and *G. orchidiflorus*.

In addition, I have now several scented and good coloured seedlings derived from Capt. Collingwood Ingram's bi-generic *X Homoglad* hybrids (*G. tristis* x the unscented *Homoglossum watsonium*).

The variations in form, colour, and scent are endless and the problem has been complicated by the production of a small number of

polyploids, mainly tetraploids — an interesting and exciting break. One of these, the tetraploid 'Corfe Castle', received an Award of Merit in 1962. They are excellent cut-flowers, without being in any way gross, and a quarter of my available space is now devoted to them; but the origin and development of these polyploids is another story.

My collection is grown under glass and with enough heat to exclude frost. It is true that *G. tristis* and the *X Homoglads* are reasonably satisfactory outside in sheltered gardens. So are the unscented hybrids of the *colvillii* and *nanus* groups, hybrids of *G. tristis* and the later-flowering species *G. blandus* and *G. cardinalis*. The crosses with the early-flowering scented species are not. I have no doubt that scent could be introduced into these hardier hybrids, without loss of hardiness, in time. I have a few scented seedlings from *G. colvillei* 'Rubra', not very attractive, but smelling a bit. This, however, is a work I must leave to someone else—how it might best be done is, like the polyploids, another story.

MAGNOLIA OBOVATA.

DOUGLAS ELLIOTT (New Plymouth).

The fragrant cream flowers of *Magnolia obovata,* 6 to 8 inches across, with a mass of bright red stamens in the centre, appear in November, long after most of the other deciduous magnolias have finished blooming. Each flower is surrounded by a collar of huge leaves, up to 1½ feet long, which are about 9 inches wide and taper sharply towards the base. Their underside is grey-green, which creates an interesting effect when they are tossed by the wind.

This native of Japan needs plenty of space as it is a big tree with wide-spread branches. In the wild it reaches a height of 100 feet, and produces a light soft timber that is highly valued because it is very workable and does not split or warp. As the flowers come after the leaves have developed and also because they are not very plentiful, the tree is not showy but the individual blooms are very beautiful and last fairly well indoors. In February the handsome red cones appear. They are 4 inches long, with hooks on their scales, and split open, when ripe, to reveal orange-coloured seeds.

M. obovata, which used to be known as *M. hypoleuca,* was introduced into America in 1865 and not until about 1884 did it come to England. The first plant at Kew was raised from Japanese seed in 1890 and flowered in 1905; so apparently, like *M. campbellii,* it is a species better propagated from layers of you want it to flower in a reasonable time.

A form with pink flowers is reported to be growing in the Royal Horticultural Society's gardens at Wisley.

A HORTICULTURAL JOURNEY TO WESTERN AUSTRALIA

(III.)

W. R. STEVENS, (Wanganui.)

A highlight was yet to come. Some miles further on we came into drier country, with sparsely scattered and somewhat stunted trees of *Acacia* and *Hakea* species. Here we came on our first sight of the famed everlastings. In amongst and around the trees, as far as the eye could see, was a sulphur cream carpet of a thousand myriad blooms of *Cephalipterum drummondii,* the slender stems carrying the flowers never more than 8ins. to 10ins. in height — a ground sheet of incredibly soft colouring. As we stood by the roadside, awed into silence by this magnificence, a gentle breeze barely stirring, we heard the sibilant rustle of the paper-like petals whispering across the landscape. Beautiful as are the individual 2in. flowers of this most distinctly formed everlasting I cannot imagine we could ever recapture in gardens their full beauty as seen in this seemingly boundless carpet.

We drove on, expecting never again to see such a sight, but only a few miles further on the road suddenly appeared to be entering a snowfield. Again we pulled up, this time to find that the landscape was being carpeted with the dead white of *Helichrysum splendidum.* The carpet again spread so far as to lose itself in the distance amongst the low shrubs and stunted small trees. Slender, almost leafless thin stems carry the 2in. diameter, daisy-like, white tissue flowers. Here and there through the snow of the *Helichrysum* showed a small sprinkling of the tiny golden everlasting, *Waitzia aurea.*

Several miles along we left the 'snowfields' of the *Helichrysum* as suddenly as we had entered it. We were told that there had been a good local rain a little earlier and this had produced the wonderful display we had been so very fortunate to see. Had there been no rain we could have driven through without ever suspecting this glory that could so transform the wilderness.

On this northern trip we passed through the country where grow *Hakea invaginata* and *Diplolaena grandiflora.* These two subjects we already grow in New Zealand, and it was therefore of great interest to study the conditions to which these choice plants are native. The *Hakea* with its long, broom-like, foliage is outstandingly beautiful in flower, with soft lilac-pink pincushion balls clustered around the upper stems of the bushes. *Diplolaena* is generally found near the coast in deep sandy soil, and it was therefore of challenging interest to us that we are succeeding with the apricot coloured 'Desert Rose' in soil with a heavy clay content.

So far I have not mentioned seed collecting, and this was an important part of our trip. On the surface seed collecting sounds so simple—you have found the plants, and all you have to do is collect the seed. But in practice it is very far from being so simple! In the first place

if the plants are in flower it is too early for seed, and when they do seed the gathering period is sometimes very short. As an example, grevilleas are a real problem as the seed capsules do not remain closed for very long, once they are ripe. Two or three weeks, and all the capsules open and drop the seed. So if you are not in that area at the critical time you need not bother looking for seed. Also, unlike many other genera the capsules cannot be collected green and ripened later. With certain other proteaceous plants such as *Hakea* and *Banksia* there is no problem as the fruits very often remain intact for years without opening — that is if there has not been any bush fires in the area. But there are many insects fond of seeds, for instance weevils, and we noticed they were fond of banksias and dryandras. This meant that about half the seed cones we collected were useless, as they were already riddled. On one occasion we came on a stand of *Banksia menziesii* only to find that *every* cone we examined was completely weevil-ridden. *Melaleucas* as a rule do not present any such problem, as the old seed capsules remain tightly closed and intact. Ants, of course, are very fond of seeds, and the ant population of Western Australia is astronomic in its numbers, which accounts for the fact that there is little, certainly no obvious regeneration, of many species. One is tempted to say that in some cases there is no regeneration, though there must always be some, or the species would no longer be in existence — they would have disappeared from the scene.

By this time, on the third day of this rushed trip, we realised that it was now past noon — and we were due back in Perth that night! There could not be many more stops. Driving back at speed, particularly when passing through the sand plain country, it was sheer agony not to be allowed to stop whenever we saw great patches of colour. We did make two stops, and both of these were exciting. The first stop was when we came on a large colony of white flowered form of *Leschenaultia biloba*. Instead of the intense blue type of this spectacular species, all the plants had clear glistening white flowers, the plants themselves being a little taller and less bushy than the type. In our travels we had seen thousands of the blue form and this was an extraordinary change. *Leschenaultia biloba* is one of the most famed of Western Australian flowers, and isolated specimens have been grown in New Zealand for many years. The plant has a reputation of being difficult to grow, but if given sufficient drainage, light soil, and sufficient moisture in the growing season, it is usually quite happy. It requires a good annual pruning. My oldest plant is sixteen years and flowers freely every year.

A little further on we made a second stop, where two notable plants were flowering. The first was *Geleznowia calycina* (pronounced jel-eznofia), a small shrub about 2 feet high with yellow flowers, each flower being surrounded by *Pimelia*-like bracts. It belongs to the same order as *Boronia*, viz. *Rutaceae*. The second plant was *Melaleuca cono-*

thamnoides, which is without doubt one of the finest of the genus. The plants were growing in deep gravelly sand and were quite bushy, a rounded shrub up to 4 feet. Every shoot had a flower, on its terminal, and the whole bush was a glow of lively reddish toned lilac. As a general rule melaleucas are very amenable to garden culture, and a great many species are grown in New Zealand. Most of them germinate very freely from seed and make rapid growth. But *Melaleuca conothamnoides* refused to do either of these things with me, and although I have a small plant in a pot I have yet to establish it in my garden.

It was now getting late in the afternoon, so it was agreed 'no more stops' until we reached Perth. But as it became dark and the headlights showed up brief patches of colour to the roadside we could not help wondering what we were missing! All were agreed that even if we made the same trip every week we should still see something different, particularly during September and October. We had driven over 1000 miles in three days and in that time we had seen hundreds of plants new to us. Our minds were almost stunned by the impact of all the beauty and colour of this 'new world' we had found and we resolved to return to it after we had seen the south western area.

It was nearly midnight when we reached Perth and our hotel.

After thanking, from our hearts, our indefatigable driver and guide, Kretch, a hot bath and bed seemed to be the most important things — and both were pure joy.

The next day we were due to take delivery of our rental car and caraban and start off on our southern itinerary. We had resolved that it would be a much more sedate tour and that we would stop whenever we wanted to — and for as long as we liked.

NOTES FROM THE CHRISTCHURCH BOTANIC GARDENS

L. J. METCALF, N.D.H. (N.Z.) (Assistant-Curator).

It is curious how weather statistics, for considerable periods, often seem bent on breaking previous records, and these past few months in Christchurch have been no exception. Since the beginning of the year less than 5 inches of rain have fallen, which is only a little more than half of the normal total for this period of the year. February with less than half an inch of rain, and April when almost the entire rainfall for the month fell on two days were the worst two months. Frequent drying winds have further aggravated the situation, and May has arrived with the necessity for watering being every bit as great as in midsummer.

It is not often in Christchurch that the conditions necessary for the production of good autumn colour prevail. However, last March was characterised by warm days and cool nights with relatively dry

conditions, and we were favoured with one of the best displays of autumn colour for several years. While such displays of autumn colour are not experienced in Christchurch every year, there are, nevertheless, quite a number of plants which colour satisfactorily every year, regardless of the conditions. In this article it is intended to review some of these reliable autumn-colouring plants.

The first tree to show autumn colour, and one of the finest, is the golden ash (*Fraxinus excelsior* 'Aurea'), which starts turning a brilliant gold in early March and continues its display for almost a month. Although still too young to really tell, a specimen of *F. excelsior* 'Aurea pendula' promises to be equally as good. Because of their more moderate habits of growth, both of these trees are well suited for home gardens.

Some of the birches, especially the silver birch (*Betula pendula*), are very variable from seed and are not always reliable in their autumn colour. However, the paper birch (*B. papyrifera*) is one which colours well every autumn. Several specimens planted along the riverbank in the Woodland and on the riverbank opposite the hospital are beautiful every autumn, especially where their reflections can be seen in the water. Growing in the Primula Garden is a young tree of *Betula maximowiczziana,* now about 20 feet high, which promises to be an exceptionally fine tree for autumn foliage. This birch, which is a native of Japan, is distinguished by its leaves being larger than those of any other species. It is a quick grower with a rather stiff branching habit and is very hardy.

Among the maples there are quite a number of fine plants which never fail to colour well. They vary from relatively small trees to large ones like the Norway maple and something to suit most plantings may be selected from amongst them. In the group of *Acer pennsylvanicum* are *A. rufinerve* and *A. hersii,* both of which have the characteristic striated bark. *Acer rufinerve* comes from Japan where it grows to a height of 30-40 feet, but in Christchurch it is only a small tree of about 15 feet. In the autumn its foliage turns brilliant shades of scarlet and orange. The bark of *A. hersii* is even more handsomely striped with white than that of *A. rufinerve* while the foliage colours to orange, scarlet, and purplish shades. It comes from Honan in China and is a very fine species. The Norway maple (*A. platanoides*) is only suitable for larger gardens, being a tree up to 60 feet or more high. Where space permits it is a pleasing tree at most times, and in the autumn the foliage generally turns into various shades of red, brown, and yellow. The form grown in the Botanic Gardens colours a uniform bright gold and is a very good type. Another large growing species is *A. cappadocicum* which may grow up to 70 feet in height, but in the Botanic Gardens is a medium sized tree of about 25 feet. *Acer cappadocicum* is a native of the Caucasus and Asia Minor with varieties extending as far as Western China. The large 5-7 lobed leaves turn a bright golden colour

every autumn regardless of the type of season. There is a cultivar, *A. cappadocicum* 'Aureum', which has yellow foliage for the greater part of the summer and colours similarly to the type in the autumn. One maple which promises to be outstanding is *A. rubrum* 'Columnare'. This is a cultivar of the red maple and with its upright growth, eventually forms a pyramidal shaped tree. Its leaves are 3-5 lobed and die off with beautiful shades of gold, orange, and scarlet. One or two other maples which produce good displays of colour every autumn are *A. japonicum, A. japonicum* 'Aconitifolium', and *A. palmatum* 'Seigan'.

Probably the most outstanding autumn foliage plant in the Gardens is a small specimen of the sorrel tree, *Oxydendrum arboreum,* which is growing in Harman's Grove in the Woodland area. Although only about 4 feet high as yet, it quite dominated the scene and stood out from any other tree in the area. The leaves are oblong-lanceolate, up to 8 inches long by 1½-3½ inches wide and somewhat glossy on the upper surface. The foliage turns a glowing scarlet in the autumn.

The two species of *Stewartia* grown in the Gardens both colour well every autumn, and they deserve much greater attention from gardeners. *Stewartia pseudo-camellia* is the first to colour and turns brilliant crimson and orange, while *S. sinensis* is a week or two later and the foliage turns deeper shades of crimson.

The common spindle tree (*Euonymus europaeus*) is very much neglected in gardens but it is, nonetheless, a fine autumn foliage plant. Even better is the Japanese spindle tree (*Euonymus yedoensis*), the leaves of which put on brilliant red and crimson shades in the early autumn. Another shrub not grown enough for its foliage is *Enkianthus campanulatus* which turns red and yellow.

Three of the last trees to produce their autumn display are incidentally three of the finest. They are *Taxodium distichum, Metasequoia glyptostroboides,* and *Ginkgo biloba.* The swamp cypress (*Taxodium*) generally colours in May and the fine, feathery foliage dies off in rich red and brown shades. Usually some of the branchlets remain bright green at the tips for a while and the effect is most unusual. Superficially the Shui-sa or so-called dawn redwood (*Metasquoia*) resembles *Taxodium* but its autumn foliage is so much more beautiful, the leaves turning to beautiful shades of brown, orange and salmon-orange. The last tree to be mentioned in this article is the well known *Ginkgo* which every autumn turns a brilliant gold. Trees of several types exist in the Gardens but the ones which produce the best effect are those of somewhat smaller stature with rather bushy heads.

NOTES FROM DUNEDIN

R. W. BALCH, N.D.H. (N.Z.).

Botanic gardens and ornamental parks in New Zealand play a very important part in the horticultural activities of its towns and cities. As well as providing passive recreation areas for its citizens, they also make pleasant places of call for visitors from other parts. Most travelling holidaymakers and overseas tourists make a beeline for the nearest public gardens when in a strange city. There they expect to find, and usually do, colourful floral displays, places to picnic in the open air, and clean and safe areas for their children to play, as well as other amenities. In Dunedin, during the summer months, hardly a day passes that does not bring its coach parties of tourists from Australia and United States to the Botanic Gardens to see the rose garden, the bedding displays, the show houses and fernery, and in particular the kiwis and other native birds in the Aviary.

Another aspect that is equally important is the catering for those who wish to learn about gardening and horticulture in general. By careful planning, and with good landscape design, combined with the growing of suitable collections of the choicer trees, shrubs and herbaceous plants that are suited to the district, the home gardener is able to obtain ideas for the planning and planting of his own garden. He can observe the colour of the flowers, the type of foliage, the habit and ultimate height of all manner of plants, and so help to overcome the traps of haphazard planting without knowing the characteristics of the

material he is attempting to use. Instructors with parties of school children, training college and university students, should find a wealth of material for their particular purposes. When labelling of plants is carefully done and well maintained, the educational value of a public garden is immeasurably greater.

The administrative facilities of these establishments also do much of value in horticultural education. Suitable conditions are provided for the practical and theoretical training of apprentices and trainees, both boys and girls. The trained horticultural staff are continually on call for the dispensing of information on a wide variety of horticultural and allied subjects, by 'phone, by letter, in person, and by giving public talks and lectures. This is a service that is invariably given with goodwill as part of their job, even though a lot of it may be in their own time without thought of recompense.

Be all this as it may, there is one point that cannot be too strongly stressed, when advising home gardeners to visit public gardens, seeking ideas for their own gardens. This is, that owing to its very nature, a public garden has vital differences from a private garden. Many of its most attractive features are not for copying in the home garden. Although public gardens do have their regular visitors, in the main they cater for a passing public, i.e., different people from day to day. In direct contrast, the home gardener designs and plants his garden for the enjoyment of his own household, friends, and possibly neighbours. In the first instance, the massed colour displays created in the spring and summer bedding are planned to last as long as possible. Crops of greenhouse plants in display houses, such as *Cyclamen,* begonias, *Coleus, Schizanthus,* chrysanthemums and so on, must each remain for many weeks before being replaced by the next in season. Collections of plants like orchids, ferns, cacti, are grown in special show houses, while in the open various areas are devoted to one particular plant — may be roses, irises or native plants. All this can be, and often is, very effective and most enjoyable for a person to visit occasionally, but it is not a garden to live with.

In a private garden the aim should be to have a change of interest from day to day; herein lies the whole charm of gardening. To go out each morning or evening to observe and wonder at the growth that has taken place since the previous day, to find some choice bulb pushing through the ground, a dwarf shrub opening its flower buds, or a rock garden plant suddenly a mass of bloom, gives something new all the time. To see the same bed of wallflowers, polyanthus, petunias or antirrhinums every day for two or three months, may satisfy the desire for colour, but where is the interest? Surely a garden carefully planned, featuring trees, shrubs, perennials, bulbs, alpine plants, all carefully blended together, each plant with its own story to tell, is infinitely more rewarding in day to day interest. In a climate such as Dunedin's, where such a tremendous range of choice plants can be happily accommodated — particularly with the smaller bulbs, alpine plants and wood-

land subjects — this type of garden can easily outclass the bedding plant garden in every way excepting that of massed colour.

The experienced public gardener has two factors constantly in mind when planning his design and planting, factors which only apply to the home gardener to a very minor extent. The first concerns the ever-present threat of damage by irresponsible persons, by traffic both foot and wheeled, and the petty thief, especially where areas are open to the public day and night. The other is ease of maintenance where one man must care for several acres. This means planning so that grass cutting can be done by machine, the asphalting of paths to eliminate weeding and raking, the avoidance of plants which need frequent attention such as staking, dead-heading, and picking over, or in other words, there must be no areas to be fussed over. There should also be freedom of movement for crowds of people from one feature to another, without the temptation to take short cuts through beds and borders or tracking across lawns. The home gardener normally has only household pets or young children to cause annoyance or damage in his garden. He finds his chief delight in treating each plant as an individual, having the time to attend to each one's specific and differing needs. He can cherish the choice and rare plant without wondering in the night whether it will still be there in the morning. The public gardener can come to dread a Monday morning inspection, to find what has gone missing this time or been mortally injured. Some have even been quoted as saying they look to see not what has gone, but rather for what has been left: rock gardens are the classic example in this case.

The greatest advantage public gardens have over private gardens is probably that of space. This gives flexibility in design, planting, and allows for special features. The comparative freedom from the constrictions of buildings and boundaries is also a tremendous asset. For good results, the private gardener must know something of the characteristics of the plant material he uses — ultimate size, colour of flowers, season of flowering, habit and whether deciduous or evergreen. He must pay particular attention in aiming to blend house and boundaries in his design, so that they form a corporate whole, appearing to have grown up together. He should plan for a continuity of interest throughout the year, avoiding glaring colour clashes. A very necessary detail is to include enough plants to supply cut flowers for the house, otherwise the choice slow-growing shrubs can suffer unduly by having their flowers picked.

What, then, can the home gardener expect to find of value when paying a visit to his local botanic gardens or ornamental park? He should be able to note the correct operations being carried out at the right time — planting, pruning, digging, cultivation. He should be able to see plants suited to the district growing in a suitable situaton and displaying their natural form and type of growth. Above all, he needs to see plants that are stocked by New Zealand nurserymen, and correctly labelled with the names by which they are generally known.

NOTES FROM PUKEKURA PARK

A. D. JELLYMAN, N.D.H. (N.Z.)

The temperature of New Plymouth's climate does not lend itself wholeheartedly to vivid autumnal displays as you see in areas where the seasons are clear cut and well defined. Perhaps I could say that New Plymouth's winter is well defined because it is associated with cold weather and Egmont's winter woollies; so too is our summer usually well defined but the intermediate seasons are not so clearly cut. For instance because *Magnolia campbellii* flowers in July you do not assume that spring is here nor can you say in March that autumn begins next month and will be over by June, because it generally is not.

There are perhaps three principle contributing factors to good autumnal colours in New Plymouth: firstly an early frost or spell of cold weather in March or April checks growth, and secondly the kindness of the weatherman for the ensuing months by keeping them free of strong gale force winds. Thirdly and perhaps most important is the selection of suitable sites and using plants best grown here for their autumnal colouring. Obviously, a sheltered pocket which may be subject to frosts or at least, cooler temperatures, is ideal. Even if only sheltered the foliage of selected plants will colour before they fall.

One of the most popular shrubs in autumn, and much in demand here, is *Cotinus americanus* which never fails us. If this is planted in a sheltered spot its leaves will persist in their well known hues for a considerable period. The dogwoods, particularly *Cornus florida* are also relied upon to put on a creditable performance, the leaves turning brilliant reds overlaid on golds.

While not setting the world on fire *Hydrangea quercifolia* adds in its own way to the scene. As the cooler weather approaches its leaves deepen in colour to plum tonings. You find similar tonings in *Berberis thunbergii* 'Atropurpurea' which also intensifies with the cooler weather. *Disanthus cercidifolius* is an uncommon plant which colours red with orange tints and always makes a good job of it. It is a member of the witch-hazel family and has pairs of dark purple, starry half-inch flowers in spring and dull green glaucus leaves very similar to those of the Judas tree.

Of the *Malus* varieties grown, the best autumn displays undoubtedly come from *M. ioensis* 'Plena', formerly named *M. angustifolia,* and the lovely semi-double pale pink *M. coronaria* 'Charlottiae' which has yellow, very sour fruits that always fall before the leaves. Both of these plants will colour to good reds and golds when in a good position. We are hoping to try *Malus tschonoskii* as a possibility here as soon as our stocks are large enough. In the Hawke's Bay area it is rated by some people as the best coloured of all *Malus.*

Maples, particularly Japanese maples, go hand in hand with shelter and without it you may almost forget about them. In exposed areas the tender leaves burn easily and soon become so unsightly that by autumn they are not attractive even if the plant does colour to any degree. Under ideal conditions *Acer sanguineum* 'Seigan' is very beautiful. The leaves colour butter yellow and gradually fall away exposing the blood red stems. This gives an overall effect of an orange shading. *Acer palmatum* does not colour fully until late in May and can persist like that until the end of June when blessed by the weather. A little hardier, and certainly a more vigorous maple, is *Acer buergerianum* which colours in brilliant red hues and makes an outstanding small tree when young.

We don't seem to have an overbundance of yellows and golds, but more tan and honey browns, provided by trees such as the oriental planes, *Platanus orientalis* and English Oak, *Quercus robur. Koelreuteria bipinnata* colours early in April to a rich orange gold but soon falls away. The leaves of *Styrax japonica* turn butter yellow as they fall but do not present any great spectacle.

In Pukekura Park we are fortunate to have two fairly large maiden hair trees, *Ginkgo biloba* and, by biding our time until mid-June, are duly rewarded with their golden yellow leaves, although they never seem as intense as the plants in the South Island. Lombardy poplars are not widespread in this district but the white poplar, *Populus alba,* has, in some local areas, and in many areas near Wanganui taken charge and grown from root suckers. A delightful effect is gained by these plants. The lower leaves turn yellow and you get the yellow leaves as well as the white clothed leaves rustling in the breeze.

Two excellent subjects for moist situations were the *Sassafras* and *Tupelo. Sassafras albidum* (syn. *officinale*) colours to light orange shades and reds. The Tupelo, *Nyssa sylvatica* develops into a small tree but has been known to grow to well over 60 feet in height. It is quite hardy, a native of the Eastern United States of America, and colours to brilliant hues of orange and flame.

Rhus succedanea is not grown by nurseryman very often nowadays because of people's allergy to contact a dermatitis from it. However, when planted out of the reach of the public, this makes a good small tree. The compound leaves gradually turn scarlet, starting from the base, working up the branches until the tree is a blaze of red. With a little shelter the leaves persist for quite a period before they are completely shed. *Rhus potaninii* is also said to make a good show but since we have no well established specimen in the Park I can not vouch for this.

The sweet gum, *Liquidamber styraciflua,* grows rapidly to a good specimen tree and usually colours fairly well about mid-May. However, far superior in New Plymouth is the Australian variety *L. styraci-*

flua var. *festeri*. This tree is generally smaller and smooth barked colours well, regularly and by some means its foliage always persists well into the winter. *L. formosana* 'Monticola' gradually turns deep red very late in the season and is always one of the last to shed its leaves.

Azalea mollis, in sheltered location, add to the autumn display with deep oranges and reds particularly after a cold April snap accompanied, as this year, with Egmont's first snowfall. A companion plant to the azaleas for colour is *Stewartia pseudo-camellia* which is sometimes surpassed by its near relative *S. ovata* when it becomes a mass of blazing scarlet.

Climbers and vines are not generally noted as autumn coloration subjects but two I feel worthy of mention are the Virginian creeper and the ornamental grape. *Parthenocissus tricuspidata*, the former, tones scarlet while *Vitis alicanthe* 'Bouchet' colours deep red and wine, both adding considerable colour to the scene.

Perhaps after this you may feel that our autumn is not so bad after all — well, at the time of writing indications are that it will be quite good, but we never can tell.

EXPLORING THE PLANT KINGDOM (2)

R. E. LYCETTE (Department of Economic Botany, Royal Botanic Gardens, Kew.)

The second of a series of articles on the experiences of a young New Zealand botanist in various parts of the world.

THE INTRIGUING PLANT LIFE OF THE WESTERN CAPE

Earth is indeed a very complex planet. It is composed of numerous combinations of elements, formed into minerals and rocks, contorted and moved by terrestrial physical forces and acted upon by the atmosphere and hydrosphere. At the surface of the planet where most of the physical phenomena meet, an infinite number of environments have been created. Sometime in its history, conditions were right and life emerged. At first when it was simple, life was rigidly governed by the physical conditions within the environment and when these changed, it either evolved to meet the new requirements, colonised another more favourable locality or died out. As more and more organisms came into being and they became more complex, they themselves became minor influences on the environment. Only when there was a physical phenomenon of widespread or catastrophic proportions, such as a volcanic holocaust or extrusion or an ice age, were some of the life forms completely lost. As a result of all this activity over hundreds of millions of years, we now live in a world full of an infinite variety of organisms, plants and animals.

The complex animal and plant societies common to earth today, are still delicately balanced with the physical environment and although this has an over all influence, it can be very successfully modified by biological life. For proof of this, one need only consider the sub-tropical rain forest or temperate evergreen forest where the tall trees supply shade, humus and water etc., for the ferns, mosses and fungi, subordinate to them, and the latter retain the water etc., for their benefactors.

In some regions of the earth, aspects of the physical environment may be extreme, and plants must be well modified to exist; such places are found in all latitudes, on the sea coast, in an arid desert, on a mountain scree slope, in the arctic tundra etc. Every continent has some of these but Africa, in its vastness, has what I consider some of the most fascinating.

Since the Carboniferous period which began about 285,000,000 years ago, the everchanging geomorphology (landscape) and climate of the African continent seems to have favoured eastern, equatorial and southern Africa for the colonisation and evolution of a very diverse vegetation. Plant colonisation was not only from the north (Eurasia) but from all the southern continents which may well have been joined or adjacent to Africa, forming Gondwanaland, up until the early Cretaceous period about 120,000,000 years ago. It was during this period that the southern continents built up their basic botanical relationships. Recent relationships are more likely to have resulted from animal migration, ocean and tidal movements, and greater effectiveness of seed development and dispersal methods as evolved by the flowering plants.

The vascular flora (flowering plants, conifers and ferns) growing naturally on the African continent has been estimated at between 40,000 and 50,000 species. This does not reflect great botanical wealth considering the African continent is the second largest land mass (over 11,262,000 square miles) and that the world's vascular flora is estimated at about 800,000 species. In view of this it is important to bear in mind that vast expanses of Africa, particularly in the northern hemisphere, are devoid of higher plants, and other areas support a vegetation of limited variety. The vegetation of the tropical belt, Great Rift valley, and southern subcontinent have by far the greatest variety e.g., the Cape Peninsula, approximately 420 square miles in extent, supports about 2200 species, many of them endemic.

It is on the borders between the botanically rich regions and those more barren that one finds some extremely fascinating plant modifications. One such locality is the Ceres Karroo in the Cape Province, where the prolific Mediterranean type vegetation of the southerly winter rainfall area has given way to the arid semi-desert. Here on one side of the mountains of the Bonteberg grow such shrubby tree species as *Protea, Leucadendron, Serruria, Polygala,* etc., and mois-

ture loving species of *Albuca, Kniphofia, Lachenalia, Moraea, Romulea, Oxalis, Drosera,* etc., while on the other side facing the arid interior grow the tough *Rhus viminalis, Acacia horrida* etc., and hundreds of succulent plant species.

The Ceres Karroo can be entered by a narrow pass through the Bonteberg, Karroopoort; when travelling through one passes from one distinct vegetation region into the other. The landscape of the Ceres Karroo can be divided into the mountainous ridges and koppies (small hills), the bahada type sand areas (an apron of sandy material along a rock face in arid areas), and the pebble plains. The former although of no great height are difficult to climb as they expose the rugged weathered faces of very contorted rocks. Between these, grow the shrubby and larger growing succulent plants including *Crassula, Cotyledon, Euphorbia, Aloe,* etc. Beneath these or in small rock pockets, grow the smaller *Conophytum, Echeveria,* etc. The bahadas and sand plains may support a few of these species also, but the scene is dominated by *Rhus viminalis* and *Acacia horrida* along with the colourful *Ruschia, Lampranthus, Caralluma* etc. It was here that I first came into contact with the grass *Ehrharta spinosa.* As its specific name suggests, it possesses spines, something I did not expect of a grass after getting to know the lush green pastures of Taranaki. During much of the year the pebble plains, appear to be completely lifeless, but it is here that one of the most incredible forms of succulent plant grows — the stone plant; perennials, so well modified to the rigorous environment they live in that often the only other plants inhabiting the area are the short lived annuals, that may spring into life after a rainstorm.

It can be seen, therefore, that water is as essential to desert plants as to any other form of life, and as the supply may be limited to either a seasonal succession of storms, a single annual event, or even seasonal evening dews, plant life must be prepared to absorb moisture whenever it is available. The roots of xerophytes (desert plants) are often long and wiry, spreading for considerable distances through the soil. Succulent plants store their water supply in modified cells within the leaves and stems and may contain up to 95 per cent water. Although abundant within the plant, water must be conserved at all times, therefore loss through transpiration and epidermal diffusion has to be guarded against, and the plant is suitably modified. Often the epidermis is covered with fine hairs or a waxy cuticle, the stomata (transpiration pores) are few in number, concealed in ridges, depressions etc., and open at restricted intervals (in some cases they open only at night). The degree of modification depends largely on the habitat of each species, and to a degree each plant, those well exposed to wind and sun usually have more elaborate modifications, although very often they may simply be deciduous during dry spells.

Protection from extremes of light and temperature is usually essential as well, and more often than not this is done by shelter within

the habitat. Some of the taller shrubby succulents have evolved methods of shielding their internal cells from the intense light of this region. It may well seem strange that plants actually shield themselves against light, particularly when it is considered that light is essential to photosynthesis (food synthesis), however this process cannot function effectively in either excess of light or heat. Protection may be afforded by pigments within the epidermis (white, yellow, grey and red are common), spicules of silica, coatings of sand or dust or by retention of old dried epidermis. Many of the smaller succulents have adapted themselves similarly, but some of them retreat into the sand or between stones as aridity and light intensity increase. Some like *Fenestraria,* even go so far as to possess 'windows' set into their uppermost parts so that when the plant withdraws into the ground, and dust blows over it, essential photosynthesis continues.

The character of the rocks and soil in which each species lives is also important, for not only has weathering of the rocks produced the soil, but their surfaces modify the temperature and light by reflection and absorption, channel water and conserve it. The history of the landscape and its formation has a direct bearing on the colonisation and evolution of plant life. This may be very well seen by examining the relationship of two species of stone plants to their environment.

Most of the stone plants belong to the *Aizoaceae* (mesembryanthemums), a family of more than 150 genera and between 2300 and 2500 species scattered throughout the warmer drier regions. Controversy rages between different authorities as to where all the members of this family fit, as so often specific and even generical divisions are based on rather minute taxonomical differences, their acceptance is rarely universal. *Lithops,* perhaps the best known stone plants, number about 50 species and are usually very localised in natural distribution occurring very often in 'tight habitats', extending over a few yards.

Lithops comptonii is a very rare species, found up until now in three localities in the Ceres Karroo. These are in the pebble plains a few miles northeast from Karroopoort; to find them I was guided by map references and notes on how to line up the landscape features. This was all very necessary as even a knowledgeable guide can walk right over them. On arrival at the locality I dropped on to my hands and knees, and crawled around gazing down at the patchwork of glazed pebbles. Pebbles in all shades of reds and browns, showing 'desert varnish', a common characteristic in some deserts. It is caused by the gradual transfer by water of iron and manganese salts etc., from the interior to the exterior of the pebble, during the warm weather conditions that frequently follow desert rainstorms. The whole process takes many thousands of years from the first stages when the rough edges are eroded away, until the exterior shows the smoothed glazed finish. *L. comptonii* is of such a shape and colour as to be concealed perfectly

between these pebbles, particularly if it has withdrawn slightly. They can best be found during spring when the multi-petalled yellow flowers are open.

When I finally found them, they appeared as two oval flattened lobes, each ¾-in. across, slightly withdrawn between the pebbles, and a translucent green-brown with a netted pattern of faint brown marks. One plant was carefully removed, so as to add to my collection, and the opportunity was taken to examine it closely. It consists of a conical fleshy body formed of two almost united leaves. A fission across the upper surface divides the plant into two flat lobes. At the base above the wiry roots, were remnants of the dehydrated bodies of the previous season. Many stone plants retain these remnants as they shelter the young tender buds during the resting stages. They are ruptured in the spring by the rapidily emerging bud.

At a location about a mile from where *L. comptonii* had been found grow a few plants of *Didymaotus lapidiformis,* another extremely rare member of the *Aizoaceae.* I had little difficulty in finding this plant as it was late September and the flowers were open. Each plant produces two multi-petalled pink flowers one at each side of the central bud. When not in flower the two fleshy chin shaped leaves of the plant blend in perfectly with the angular grey-brown pebbles which are scattered across the sand drifts of its environment.

Ineffective seed dispersal may well be one of the reasons why some of these stone plants have restricted habitats; very often there seems to be little other reason why one species could not exist in what appears to be identical environmental conditions elsewhere. Some similarity 'reduced succulents' belonging to other families have a much wider distribution; one such plant is *Crassula columnaris.* Its relatives are distributed through southern and tropical Africa, Europe, Asia and North America, and its habitat occurs widely in Namaqualand and the Karroo regions of the Cape Province. *C. columnaris* is a low growing plant never exceeding 4ins., when it is not capped by its small scented yellow flowers it reminds one of a brown Brussels Sprout bud half buried in the ground. After its flowering period in early summer the plant dies, producing buds which break away and root on contact with the ground.

Natural vegetative propagation is common amongst succulent plants and it has aided the distribution of many species. Numerous genera containing succulent plants have a wide African distribution e.g., *Euphorbia, Aloe, Kalanchoe, Caralluma* etc. The American equivalent is the *Cactaceae.* Few members of the *Cactaceae* are indigenous to regions outside the Americas, one genus *Rhipsalis* occurs in Africa; but like the succulent plants of Africa they are well suited to habitats lacking freely available water.

PUBLICATIONS RECEIVED

PLANTS OF THE NEW ZEALAND COAST, by Lucy B. Moore and Nancy M. Adams (Pub. Paul's Book Arcade, Auckland and Hamilton, 15/-).

New Zealand's lengthy coast line, combined with the fact that so much of our population lives within easy reach of the sea, encourages the study of plants that grow naturally along the coast and in the sea itself. For some years students and teachers studying the plant life of the coast have been using three bulletins issued by the New Zealand Department of Education to post-primary schools. These have now been revised and rearranged and are contained in this single volume.

About one third of the book is devoted to seaweeds of green, brown and red groups. There is also a section dealing with sand-dune plants. Plants that grow on rocky coasts and mangrove swamps are also dealt with. All are listed under family headings. Miss Adams' art as an illustrator of plants is well-known, and her drawings of many of the species contained in this book will help considerably in their identification.

REPORT OF THE EXAMINING BOARD.

On behalf of the Examining Board I have pleasure in submitting the following Report for 1963.

(1) MEETINGS: The Board met on four occasions during the year with an average attendance of 9 members.

(2) SYLLABUS OF EXAMINATIONS: The Examinations Syllabus of the Institute includes the following Diplomas and Certificates:

(a) National Diploma in Horticulture — N.D.H.(N.Z.).
(b) National Diploma in Fruit Culture — N.D.F.C.(N.Z.).
(c) National Diploma in Apiculture — N.D.Ap.(N.Z.).
(d) Certificate in Vegetable Culture — C.V.C.(N.Z.).
(e) Certificate in School Gardening — C.S.G.(N.Z.).
(f) Seedsman's Certificate — S.C.(N.Z.).

(3) HONORARY DIPLOMAS IN APICULTURE: Altogether seventy five applications were received and considered jointly by the Executive of the National Beekeepers' Association and the Examining Board. Authority to award Diplomas in Apiculture without examination expired on 8th September 1963 — two years from the date of the gazetting of the Regulations sanctioning the conduct of examinations and the issuing of diplomas and certificates in Apiculture. Honorary Diplomas could be awarded without examination to persons not less tan 40 years of age with not less than 20 years experience in beekeeping. Honorary Diplomas were awarded to seventy approved applicants, and arrangements for the presentation of certificates were made through District Councils and the Beekeepers' Association.

(4) APPLICATIONS FOR REGISTRATION FOR EXAMINATIONS: During the year applications were accepted from new candidates for the following examinations:

		1962
National Diploma in Horticulture	27	(22)
National Diploma in Fruit Culture	4	(2)
Certificate in Vegetable Culture	2	(2)
Certificate in School Gardening	—	(—)
Seedsman's Certificate	—	(—)
National Diploma in Apiculture	1	(1)

(5) 1963 EXAMINATIONS:

(1) **Results** — these are appended separately.

(2) **Statistics** — the following tables will be of interest, 1962 corresponding figures are shown in parenthesis.

N.D.H. Examination:	**Junior**	**Intermediate**	**Diploma**
Number of Entries	45 (47)	29 (31)	17 (9)
Number of Passes	30 (28)	19 (24)	14 (7)
Percentage of Passes	66.6 (59.5)	65.5 (77.4)	82.3 (77.7)
Average marks (Passes only)	60.5 (63.5)	62.5 (62.1)	62.3 (64.4)
N.D.F.C. Examination:			
Number of Entries	9 (2)	1 (4)	6 (3)
Number of Passes	8 (2)	1 (4)	5 (2)
Percentage of Passes	88.8 (100)	100 (100)	83.3 (66.6)
Average Marks (Passes only)	68.2 (73)	64 (61.8)	63.1 (59)
N.D.Ap. Examination:			
Number of Entries	1 (—)	2 (—)	
Number of Passes	1 (—)	2 (—)	
Percentage of Passes	100 (—)	100 (—)	
Average Marks (Passes only)	65 (—)	81 (—)	

Extra Certificate — N.D.H. It is pleasing to report that **one** holder of the N.D.H. sat for and successfully obtained the Extra Certificate in 'Nursery Management'.

	Cert. in School Gardening	**Cert. in Vegetable Culture**
Number of Entries	1 (2)	1
Number of Passes	1 (2)	1
Percentage of Passes	100 (100)	100
Average Marks (Passes only)	63 (70)	51

(6) The following candidates completed sections of the examinations this year — 1963:

N.D.H. Junior Certificate:
Miss M. L. Ballagh (Christchurch)
Miss A. B. Carter (Wellington)
D. L. Chapple (Auckland)
P. K. Hood (Auckland)
I. H. Howell (New Plymouth)
D. F. Hughes (Tapanui)
E. H. Latimer (Auckland)
J. P. Rumbal (New Plymouth)
B. R. Young (Auckland)

N.D.H. Intermediate Certificate:
L. Baker (Palmerston North)
J. B. Laurenson (Auckland)
G. D. Mander (New Plymouth)
P. S. Thompson (Christchurch)
C. M. Walker (Auckland)

N.D.H. Final:
D. C. Bell (Christchurch)
I. A. McGregor (Wellington)
R. I. Mulholland (Christchurch)
R. R. White (Geraldine)

N.D.F.C. Junior Certificate:
J. A. Lees (Kaikohe)
M. J. Paynter (Hastings)

Certificate in School Gardening— Final:
P. J. Devlin (Hamilton)

N.D.Ap. — Junior Certificate:
V. A. Cook (Oamaru)

(7) ORAL AND PRACTICAL EXAMINATIONS: The 1963 examinations for all candidates were held in Christchurch where the facilities again proved to be very satisfactory and afforded efficient conduct of the examinations for all concerned. The Examining Board expresses its sincere thanks to Mr Gilpin (Director) and Staff of the Christchurch Botanic Gardens, and officers of the Department of Agriculture for their valued assistance and the facilities offered. The Board also expresses deep thanks to the Canterbury District Council for hospitality given to candidates and examiners.

Statistics for the Oral & Practical Examinations:

	N.D.H.			N.D.F.C.			N.D.Ap.
	I	II	III	I	II	III	II
Number of Entries	14	7	4	4	—	1	1
Number of Passes	11	4	4	4	—	1	1

(8) REMIT FROM 1963 DOMINION CONFERENCE: The Examining Board carefully considered the remit referred from the 1963 Conference in respect of the holding of Oral and Practical examinations in the North and South Islands in alternate years. The suitability of certain North Island centres was considered. Levin Horticultural Research Station is not developed sufficiently to offer adequate facilities. The Palmerston North City Council Nursery is not adequate in itself for all examination requirements, but a combination of the facilities at Massey University of Manawatu and the Palmerston North City Council Gardens and Nursery might prove satisfactory, and this possibility is being thoroughly inspected and investigated before coming to a final decision.

(9) GOVERNMENT GRANT FOR EXAMINATIONS: The Examining Board acknowledges with appreciation the increase in capitation approved by the Minister of Agriculture for assistance to the Institute in the conduct of the examinations.

The formula and rate for the payment of this capitation is now:

For each candidate actually examined each year £3 0 0

For each candidate registered at 31st March each year £2 10 0
(provided candidate has been active within the previous 3 years)

This represents an increase of 10/- per head.

(10) PERSONAL: The Examining Board places on record its regret at the death of Mr L. F. Sired, A.H.R.I.H.(N.Z.), (in December 1962) who was a member of the Board at his death and had served on it for several years. He was particularly conversant with matters relating to horticultural apprentices having served also on the Horticuitural Apprenticeship Committee. His advice and contribution to the Board's work were most helpful at all times and greatly appreciated.

The Board regrets also the illness of Mr K. C. Hockey (a member) which has prevented him from attending meetings during the latter part of the year. The appointment of Dr J. S. Yeates to the Board during the year was warmly welcomed.

(11) ACKNOWLEDGEMENTS: The Examining Board acknowledges with sincere thanks the help and assistance received from all who have been associated with the conduct of the examinations this year.

(a) The panel of examiners.

(b) The Christchurch City Council Parks and Reserves Department, and officers of the Department of Agriculture.

(c) Honorary supervisors at centres for written examinations.

(d) The Canterbury District Council for assistance and hospitality with Oral and Practical examinations.

(e) The Director of Horticulture and Officers of the Horticulture Division.

(f) The National Beekeepers' Association of New Zealand Inc., for their collaboration and help in matters relating to the National Diploma in Apiculture.

(g) The Dominion Secretary, Mr K. J. Lemmon, for his courteous and efficient attention to the Board's business.

On behalf of the Examining Board,
H. D. GORDON, Chairman.

1963 EXAMINATIONS

The results of this year's examinations conducted by the Royal New Zealand Institute of Horticulture in Horticulture, Fruitculture, Apiculture, Vegetable Culture, and School Gardening, both written and practical, have been released. The oral and practical examinations were conducted at Christchurch which is the permanent examination centre for all candidates in the oral and practical examinations.

A total of 65 candidates presented themselves for examination and the percentage of passes obtained was 77%.

The coveted Cockayne Memorial Medal for the candidate completing the Diploma in Horticulture and gaining the highest average marks in the final stage of the examination was awarded to D. C. Bell of Christchurch; the Junior Memorial Prize for the candidate gaining the highest marks in the Oral and Practical Stage I examination was awarded to D. J. Kinvig of Christchurch; the David Tannock Memorial Prize for the highest marks in the Oral and Practical examination Stage III was awarded to G. L. MacFarlane of Christchurch.

The subjects in which passes have been gained by candidates are indicated by code numbers as follows:—

Bookkeeping (2), horticultural botany (3), plant protection stage I (4), oral and practical stage I (5), principles of botanical classification (6), horticulture stage I (7), special subject (8), oral and practical stage II (9), horticulture stage II (10), plant protection stage II (11), oral and practical stage III (12), thesis (13), horticultural economics (14), fruit culture stage I (15), fruit culture stage II (16), extra certificate (17), school gardening study (18), Business Aspects of vegetable culture (19), Apiary Products (20).

AUCKLAND:

Barber, E. M., 12.
Chapple, D. L., 2, 6.
Dun, B. G., 3.
Hood, P. K., 5.
Laurenson, J. B., 6.
Latimer, E. H., 5, 6, 8.
McLeary, W. H., 11.
McKenzie, B. L., 5.
Young, B. R., 3, 4, 5.
Walker, C. M., 9.

CHRISTCHURCH:

Aitken, N. A., 2, 8.
Bell, D. C., 13.
Jarvis, F. S., 3, 4.
Jones, G. L. K., 11.
Kinvig, D. J., 5.
Macfarlane, G. L., 11, 12.
Scadden, W. J., 4.
Mulholland, R. I., 13.
Stagg, I., 3, 5.
Thompson, P. S., 8, 9.
Whittle, L. F., 9.
White, R. R., 12, 13.

DUNEDIN:

Jackson, R. P., 5.

HAMILTON:

Devlin, P. J., 18.
Pick, K. J., 15.
Porteous, B. E., 3.

KAIKOHE:

Lees, J. A., 3, 4, 5.

LEVIN:

Ballagh, M. L., 2.
Bennett, R. D., 19.
Foxton, G., 4, 5.
Van der Mespel, G. J., 13.

HASTINGS:

Paynter, M. J., 2, 5.

NELSON:

Gay, D. S., 5.
Robinson, W. D., 8.
Wells, I. M., 11, 12, 14, 16.

NEW PLYMOUTH:

Howell, I. H., 4, 5.
Jellyman, A. D., 17.
Mander, G. M., 9.
Rumbal, J. P., 4.

OAMARU:

Cook, V. A., 3, 9, 20.

PALMERSTON NORTH:

Baker, L., 8.

TAPANUI:
Hughes, D. F., 8.

TE AWAMUTU:
Mason, F. O., 3.

WELLINGTON:
Alexander, H. H., 3, 5.
Butler, J. D., 11, 12.
Lokum, L., 2, 5.
McGregor, I. A., 13.
Wale, G. M., 3, 4.
Winter, M. B., 2, 5.

The following have now completed sections or the whole examination:

N.D.H. Junior Certificate:

Miss M. L. Ballagh (Christchurch)
Miss A. B. Carter (Wellington)
D. L. Chapple (Auckland)
P. K. Hood (Auckland)
D. F. Hughes (Tapanui)
E. H. Latimer (Auckland)
J. P. Rumbal (New Plymouth)
B. R. Young (Auckland)

N.D.H. Intermediate Certificate:

L. Baker (Palmerston North)
J. B. Laurenson (Auckland
G. D. Mander (New Plymouth)
P. S. Thompson (Christchurch)

N.D.H. Final:

C. M. Walker (Auckland)
D. C. Bell (Christchurch)
I. A. McGregor (Wellington)
R. I. Mulholland (Christchurch))
R. R. White (Geraldine)

N.D.F.C. Junior Certificate:

J. A. Lees (Kaikohe).
M. J. Paynter (Hastings)

Certificate in School Gardening — Final:

P. J. Devlin (Hamilton)

N.D.Ap. — Junior Certificate:

V. A. Cook (Oamaru).

Royal New Zealand Institute of Horticulture (Inc.)

APPLICATION FOR MEMBERSHIP

I hereby make application for membership of the Royal New Zealand Institute of Horticulture, Inc., and agree to abide by the conditions and rulings of the Institute.

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Full Name .....

Address .....

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Occupation .....

Date .....

Signature .....

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